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310/320/330/340

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GEK-49265C

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TermiNet* DATA COMMUNICATION PRODUCTS

TermiNet 310/320/330/340 LINE PRINTERS SERVICE MANUAL GEK-49265C

GENERAL ELECTRIC

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The information contained herein does not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to General Electric Company, USA.

TermiNet DATA COMMUNICATION PRODUCTS

NOTICE

THIS MANUAL CONTAINS GENERAL SERVICE INFORMATION FOR THE TERMINET 310/320/ 330/340 FAMILY OF LINE PRINTERS. SPECIFIC SERVICE INFORMATION FOR PRINTERS WITH PARTICULAR INTERFACES AND OTHER CUSTOM FEATURES IS AVAILABLE IN SEPARATE INSTRUCTION MANUALS.

TermiNet 310/320/330/340 LINE PRINTERS SERVICE MANUAL GEK-49265C

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PREFACE

This manual provides service instructions for the TermiNet 340 Family of Line Printers including the Model 310, 320, 330 and 340. Basic differences between the four models are pointed out where appropriate. Additional information regarding operation and service of these Line Printers may be obtained from the publications listed below.

Operation

TermiNet 310/320/330/340 Line Printer Operator's Manual GEK-49264

Service

TermiNet 310/320/330/340 Line Printer Installation Manual GEK-49263

TermiNet 310/320/330/340 Line Printer Parts Manual GEK-49266

Line Printer Service Drawings GEZ-5787

Buffered Parallel Interface Board (HINT) GEK-35997

Unbuffered Parallel Interface Board (CINT) GEK-49271

Serial Closed Loop Buffered (with HINT) or Unbuffered (with CINT) Interface Board (SAUX) . GEK-49283

TABLE OF CONTENTS

	TITLE	PAGE
CHAPTER 1	INTRODUCTION	1-1
CHAPTER 2	INSTALLATION AND CHECKOUT	2-1
Section 1	Installation	2-1
Section 2	Checkout	2-11
CHAPTER 3	OPERATION	3-1
CHAPTER 4	PRINCIPLES OF OPERATION	4-1
Section 1	Line Printer Desciption	4-1
Section 2	Mechanical Operation	4-5
Section 3	Printed Wire Boards	4-11
Section 4	Glossary	4-42
CHAPTER 5	MAINTENANCE	5-1
Section 1	Prevertive	5-1
Section 2	Troubleshooting	5-7
Section 3	Parts Replacement and Adjustments	5-25
APPENDIX A	DEFINITIONS OF TERMS	A-1

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1-1	TermiNet 340 Line Printer	1-1
1-2	American Standard Code for Information Interchange (ASCII) Code Chart	1-2
1-3	TermiNet 340 Line Printer Model Number Code Chart	1-6
2-1	Printer Unpacking Procedure	2-3
2-2	Right Side—TermiNet 340 Line Printer	2-4
2-3	Multivoltage Transformer—Front View	2-5
2-4	Ink Ribbon Cartdridge Installation	2-6
2-5	Re-Inker Installation	2-7
2-6	Printer Paper Loading	2-8
2-7	Multivoltage Transformer—Rear View	2-9
3-1	Power On Switch	3-1
3-2	VFU Option	3-1
3-3	Standard TermiNet Line Printer Control Panel Functions	3-2
3-4	Buffered Parallel Interface TermiNet Line Printer Control Panel Functions	3-3
3-5	Unbuffered Parallel Interface TermiNet Line Printer Control Panel Functions	3-4
3-6	Paper Tape for Use with VFU	3-5
3-7	Manual Punch and Splicer	3-6
3-8	Example of 66-Line, 11-inch (27.9 cm) Form Preparation Using a Punch and Splicer	3-7
3-9	Front Paper Feeding Using Shelf and Tray	3-10
3-10	Rear Paper Feeding Using Shelf and Tray	3-10
3-11	Front Paper Feeding Using Tray with Extenders	3-10
3-12	Static Strap Connection	3-10
4-1	TermiNet 340 Line Printer Functional Block Diagram	4-4
4-2	Drive Mechanism	4-5
4-3	TermiNet 340 Printer Showing Ink Ribbon Cartdridge Installed	4-5
4-4	Hammer and Print Belt Assembly	4-7
4-5	Hammer and Actuation Mechanics	4-7
4-6	Line Feed Mechanics	4-8
4-7	High Voltage Switcher Board (HVS)	4-12
4-8	High Voltage Switcher Board Circuit Diagram	4-13
4-9	Line Hammer Decoder Board (LHD)	4-14
4-10	LHD Board Circuits	4-17
4-11	Power Supply Regulator Board (PSR)	4-21
4-12	Power Supply Regulator Circuit Block Diagram	4-22
4-13	Photoelectric Sensor on PSR Board	4-23
4-14	Logic Board (LOG)	4-24
4-15	Logic Board Circuit Diagram	4-27
4-16	Low Speed Detect Circuit Waveform	4-32
4-17	Timing Signal Waveforms	4-34
4-18	Power Control Board (XPS)	4-35
4-19	Power Control Board Circuit Diagram	4-36
4-20	Interface Board (INT)	4-37
4-21	Interface Board (INT/2)	4-41

LIST OF ILLUSTRATIONS (Continued)

FIGURE	TITLE	PAGE
5-1	Cleaning Type Fingers	5-2
5-2	Left Idler Pulley and Jackshaft Bearing	5-5
5-3	Lubrication and Adjustment Points—Left Side	5-5
5-4	Lubrication and Adjustment Points—Right Side	5-5
5-5	Lubrication Points—Left Side	5-5
5-6	Status Indicators	5-11
5-7	LHD Board to Hammer Coil Connections	5-19
5-8	Location of Top Hammer Bank Connections	5-19
5-9	Relative Positions of Coil Bank Assemblies as Viewed from Right End	5-20
5-10	VFU to Mother Board Connections	5-21
5-11	TermiNet 340 Line Printer—Right Side	5-26
5-12	Adjusting Platen Clamp Assembly	5-27
5-13	TermiNet 340 Line Printer—Left Side	5-27
5-14	Bustle Assembly	5-28
5-15	Font Tab Finger Detail	5-30
5-16	Paper Shield and Rack	5-30
5-17	Vernier Tractor Adjusting Mechanism	5-31
5-18	Paper Handler Tractor—Left Side	5-32
5-19	Friction Brake Assembly	5-32
5-20	Tractor Drive Shaft Gear Replacement	5-33
5-21	Toggle Assembly	5-34
5-22	Paper Tension Control Installation	5-35
5-23	Front Low Paper Switch	5-36
5-24	Paper Sensors	5-37
5-25	Top Cover Interlock Switch	5-37
5-26	Top Cover Interlock Switch Connections	5-38
5-27	Control Panel and LCP Board	5-38
5-28	Switch and Indicator Replacement	5-39
5-29	RUN/LOAD Switch Adjustment	5-39
5-30	VFU Detail	5-40
5-31	VFU Adjustment	5-40
5-32	Slew Strobe Assembly	5-41
5-33	Alignment of Detector Assembly with Strobe Disc Slot	5-41
5-34	Channel 1 Oscilloscope Connection to XPS Board	5-42
5-35	Typical Waveforms	5-43
5-36	Multivoltage Power Supply	5-44
5-37	AC Switch and Filter Assembly	5-46
5-38	Correct Cooling Air Flow	5-47
5-39	Front Cooling Fan	5-47
5-40	Bottom Cooling Fan	5-48
5-41	Power Supply	5-49
5-42	Left Drive Belt Adjustment	5-50
5-43	Hammerbank Connector Removal	5-50
5-44	Access Hole	5-51
5-45	Horizontal Scale	5-51
5-46	Hammer and Print Belt Assembly Removal	5-52
5-47	Alignment of Magnetic Belt Guide and Rebound Bar with Print Belt Pulleys	5-54

LIST OF ILLUSTRATIONS (Continued)

FIGURE	TITLE	PAGE
5-48	Magnetic Belt Guide Horizontal Adjustment	5-54
5-49	Portion of Printout Showing Example of Gapping	5-55
5-50	Clevis and Plunger Removal	5-57
5-51	Hammer and Print Belt Assembly (Front View)	5-58
5-52	Ribbon Drive Assembly	5-59
5-53	Left Pulley Shaft and Ribbon Drive Assemblies	5-60
5-54	Right Pulley Assembly	5-61
5-55	Hammer and Print Belt Assembly—Left End	5-62
5-56	Linefeed Clutch	5-64
5-57	Jackshaft Adjustment	5-64
5-58	Linefeed Solenoid Adjustment	5-65
5-59	Platen Drive Gears	5-66
5-60	Platen Assembly Detail—Left End	5-67
5-61	Platen Assembly Detail—Right End	5-67

LIST OF TABLES

TABLE NO.	TITLE	PAGE NO.
1-1	Printing Speeds	1-3
2-1	Line Printer Interface	2-11
3-1	Vertical Slewing Commands	3-9
4-1	Interface Signals	4-38
5-1	Special Tools and Lubricants	5-3
5-2	Suggested Standard Tools	5-3
5-3	Lubrication	5-4
5-4	Adjustments	5-6
5-5	Fuses	5-7
5-6	Printed Wire Board (PWB) Wire Straps	5-8
5-7	Troubleshooting with LED Indicators	5-12
5-8	Hammer Coil to Mother Board Connections	5-20
5-9	VFU to Mother Board Connections	5-22
5-10	Parts Interchangeability	5-25
5-11	AC Switch and Line Filter Connections	5-46

INDEX

	PAGE
AC Switch and Filter Assembly	5-45
Adjustment, Vernier Tractor	4-8
Adjustment Checks	5-1
Adjustments, Parts Replacement and	5-25
Adjustment of the VFU	5-40
Adjustment of Slew Strobe Assembly—Method A	5-42
Adjustment of Slew Strobe Assembly—Method B	5-42
Adjustment of Magnetic Belt Guide and Rebound Bar	5-52
Adjustment of Magnetic Belt Guide, Vertical	5-53
Adjustment of Magnetic Belt Guide, Horizontal	5-54
Adjustment (Linefeed Solenoid)	5-65
Assemblies, Clevis and Plunger	5-55
Assembly Slew Strobe	3-1
Assembly, Hammer and Print Belt	4-6
Assembly, Slew Strobe	4-8
Assembly, Paper Shield	5-30
Assembly, Toggle	5-33
Assembly, Vertical Format Unit (VFU) and Slew Strobe	5-39
Assembly, Replacement of Stobe Detector	5-42
Assembly, Bustle	5-43
Assembly, AC Swtich and Filter	5-45
Assembly, Hammer and Print Belt	5-50
Assembly, Ribbon Drive	5-58
Assembly, Left Pulley Shaft	5-59
Assembly, Right Pulley	5-60
Assembly, Photocell	5-61
Assemlby, Line Feed Clutch and Strobe Disc	5-63
Bearings, Jackshaft	5-64
Belt Guide, Front	5-54
Belt, Left Drive	5-49
Belt, Rebound	5-52
Belt, Right Drive	5-62
Board Replacement, Bustle	5-29
Board, Control Panel and LCP	5-38
Boards, Printed Wire	4-11
Boards, Bustle (Replacement)	5-28
Boards, Printed Wire, Handling of	5-28
Bottom Cooling Fan	5-48
Brake, Friction	5-32
Bustle Boards (Replacement)	5-28
Bustle Board Replacment	5-29
Bustle Assembly	5-43
Button-up	5-2
Cartridge, Ribbon	1-5
Character Set, Print	1-4
Character Spacing	1-4
Checkout, Installation and	2-1
Checkout	2-11
Checkout Procedure	2-11
Checks, Adjustment	5-1
Checks, Operation	5-1
Cleaning and Lubrication	5-1
Cleaning, External	5-1
Cleaning, Internal	5-1
Clevis and Plunger Assemblies	5-55
Code Compliance	1-2
Compatibility, System	2-1
Compliance, Code	1-2
Connections, LHD Board—Hammer Coil	5-19
Connections, VFU to Mother Board	5-21
Control, Print	1-4
Control, Motor	4-2
Control, Paper Action	4-2
Control, Paper Tension	5-34
Control Panel and LCP Board	5-38
Converting Tractors	5-31
Cooling Fans	5-47
Cooling Fan, Front	5-47
Cooling Fan, Rear	5-48
Cooling Fan, Bottom	5-48
Cosmetic Shield	5-26
Data Interface	1-4
Data Transfer	4-2
Definitions of Terms	A-1
Description, General	1-1
Description (VFU Option)	3-1
Description, Line Printer	4-1
Description, Functional	4-1
Disassembly (Platen)	5-66
Drive Motor Pulley, Reversal of	2-6
Drive Belt, Left	5-49
Drive Assembly, Ribbon	5-58
Drive Belt, Right	5-62
Drive Gears, Platen	5-65
Drive, Main	4-5
Drive, Ribbon	4-5
Electronic Logic Module	1-2
Electrical (Troubleshooting)	5-7
Environment	1-3
Expendable Supplies	2-1
External Cleaning	5-1

INDEX (Continued)

	PAGE
Fan, Bottom Cooling	5-48
Fan, Front Cooling	5-47
Fan, Rear Cooling	5-48
Fans, Cooling	5-47
Feed, Line	4-8
Filter Assembly, AC Switch and Filter	5-45
Finger, Print	5-29
Font Tab Finger Replacement	5-29
Formatting, Vertical	4-9
Forms, Positioning	1-4
Friction Brake	5-32
Front Low Paper Sensor	5-36
Front Cooling Fan	5-47
Front Belt Guide	5-54
Functional Description	4-1
Function (HVS)	4-11
Function (LHD)	4-14
Function (LOG)	4-23
Function (PSR)	4-21
Function (XPS)	4-35
Function (INT/2)	4-37
Fuses (HVS)	4-11
Fuses (LHD)	4-14
Fuses (PSR)	4-21
Fuses (LOG)	4-23
Fuses (XPS)	4-35
Fuses (INT/2)	4-38
Fuses (Troubleshooting)	5-7
Gear and Bearing, Tractor Drive Shaft	5-33
Gears, Platen Drive	5-65
General Description	1-1
General, (Line Printer Description)	4-1
General, (Paper Handling)	4-8
General, (Maintenance)	5-1
Glossary	4-42
Guide, Troubleshooting	5-14
Guide, Front Belt	5-54
Hammer and Print Belt Assembly	4-6
Hammer Coil Connections, LHD Board	5-19
Hammer and Print Belt Assembly	5-50
Hammer Return Spring	5-56
Handling, Paper	1-3
Handling, Paper	4-8
Handling of Printed Wire Boards	5-28
High Voltage Switcher Board (HVS)	4-11
Holder, Paper	5-52
Horizontal Scale	5-51
Horizontal Adjustment of Magnetic Belt Guide	5-54
HVS, High Voltage Switcher Board	4-11
Indicators, Switches and	3-1
Indicators, Switches and	5-39
Indicators, Status	5-11
Ink Ribbon Cartridge and Re-inker Installation	2-6
Input Power	1-3
Inspection, Visual	5-1
Inspection	5-2
Installation and Checkout	2-1
Installation, Preparation for	2-1
Installation	2-2
Installation, Paper	2-7
Instructions, Unpacking	2-2
Instruction, Operator	2-12
INT/2, Interface Board	4-37
Interface	4-1
Interface Board (INT/2)	4-37
Interface, Data	1-4
Interlock Switch, Top Cover	5-37
Internal Cleaning	5-1
Introduction	1-1
Introduction (Operation)	3-1
Introduction (Parts Replacement and Adjustments)	5-25
Jackshaft Bearings	5-64
LCP Board, Control Panel and	5-38
Left Drive Belt	5-49
Left Pulley Shaft Assembly	5-59
LHD Board—Hammer Coil Connections	5-19
LHD Printed Wire Board (PWB) Troubleshooting	5-22
LHD, Line Hammer Decoder Board	4-14
Line Feed	4-8
Line Feed Clutch and Strobe Disc Assembly	5-63
Line Hammer Decoder Board (LHD)	4-14
Line Printer Description	4-1
Line Spacing	1-4
Linefeed Solenoid	5-65
LMB, Motherboard	4-11
LOG, Logic Board	4-23
Logic Module, Electronic	1-2
Logic Board (LOG)	4-23
Low Paper Sensor, Front	5-36
Low Paper Sensor, Rear	5-36
Lubrication, Cleaning and	5-1

INDEX (Continued)

	PAGE
Lubrication	5-2
Magnetic Belt Guide, Vertical Adjustment of	5-53
Magnetic Belt Guide, Horizontal Adjustment of	5-54
Main Drive	4-5
Maintenance	5-1
Material, Shipping	2-1
Mechanism, Print	1-1
Mechanical Operation	4-5
Mechanical (Troubleshooting)	5-7
Model Number	1-5
Module, Electronic Logic	1-2
Motherboard (LMB)	4-11
Mother Board Connections, VFU to	5-21
Motor Control	4-2
Motor	5-49
Multiple Voltage Power Supply	5-44
Number, Model	1-5
Number, Serial	1-5
Operating Area Preparation	2-1
Operator Instruction	2-12
Operation	3-1
Operation (6 or 8 LPI Option)	3-8
Operation, Princeiples of	4-1
Operation, Mechanical	4-5
Operation Checks	5-1
Option, Vertical Format Unit (VFU)	1-4
Option, Paper Tension Control	1-4
Option, Vertical Format Unit	3-1
Optional Paper Feeding Commands	3-8
Option, 6 or 8 Lines per Inch	3-8
Optional, Paper Shelf, Tray, and Tray Extenders	3-10
Options, Strapping	5-8
PSR, Power Supply Regulator Board	4-21
Paper Action Control	4-2
Paper Handling	1-3
Paper Slewing	1-4
Paper Tension Control Option	1-4
Paper Installation	2-7
Paper Feeding Commands, Optional	3-8
Paper Shelf, Tray, and Tray Extenders (Optional)	3-10
Paper Handling	4-8
Paper Tension	4-8
Paper Shield Assembly	5-30
Paper Rack	5-30
Paper Handler Tractor	5-30
Paper Tension Control	5-34
Paper Out Switch	5-36
Paper Holder	5-52
Parity	1-4
Parts Replacement and Adjustments	5-25
Photocell Assembly	5-61
Photocell Timing (Phasing Adjustment)	5-62
Platen	5-26
Platen Drive Gears	5-65
Platen Repair	5-66
Plunger Assemblies, Clevis and	5-55
Positioning, Forms	1-4
Power Supply	2-1
Power Supply Regulator Board (PSR)	4-21
Power Control Board (XPS)	4-35
Power Supply (XPS) Board, (Replacement)	5-27
Power Supply, Multiple Voltage	5-44
Power Switch	5-47
Power Supply	5-48
Power, Input	1-3
Preparation for Installation	2-1
Preparation, Operating Area	2-1
Preparation for Use	2-9
Preparing the VFU Paper Tape	3-5
Preventive (Maintenance)	5-1
Principles of Operation	4-1
Principles of Operation (HVS)	4-11
Principles of Operation (LHD)	4-14
Principles of Operation (PSR)	4-21
Principles of Operation (LOG)	4-23
Principles of Operation (XPS)	4-35
Principles of Operation (INT/2)	4-38
Print Belt Assembly, Hammer and	5-50
Print Mechanism	1-1
Print Line Length and Printing Speed	1-3
Print Character Set	1-4
Print Control	1-4
Print Belt Assembly, Hammer and	4-6
Print Finger	5-29
Print Belt and Adjustment of Magnetic Belt Guide	5-52
Print Belt Replacement	5-52
Printer Synchronization	1-2
Printed Wire Boards	4-11
Printing Speed, Print Line Length and	1-3
Printing	4-2
Procedure, Checkout	2-11
Protection	4-2
Pulley, Reversal of Drive Motor	2-6
Pulley Shaft Assembly, Left	5-59

INDEX (Continued)

	PAGE
Pulley Assembly, Right	5-60
Rack, Paper	5-30
Re-inker	1-5
Re-inker Installation, Ink Ribbon Cartridge and	2-6
Rear Cooling Fan	5-48
Rear Low Paper Sensor	5-36
Reassembly (Platen)	5-67
Rebound Belt	5-52
Repair, Platen	5-66
Replacement, Font Tab Finger	5-29
Replacement, VFU	5-39
Replacement of Strobe Detector Assembly	5-42
Replacement, Print Belt	5-52
Replacement, (Linefeed Solenoid)	5-65
Return Spring, Hammer	5-56
Reversal of Drive Motor Pulley	2-6
Ribbon Cartridge	1-5
Ribbon Drive	4-5
Ribbon Drive Assembly	5-58
Ribbon Cartridge Support Springs	5-61
Right Pulley Assembly	5-60
Right Drive Belt	5-62
Run/Load Switch	5-39
Scale, Horizontal	5-51
Self Test Feature	4-3
Self Test	5-10
Sensor, Front Low Paper	5-36
Sensor, Rear Low Paper	5-36
Serial Number	1-5
Shield, Cosmetic	5-26
Shipping Material	2-1
Size and Weight	1-2
Slew Strobe Assembly	3-1
Slew Strobe Assembly	4-8
Slew Strobe Assembly, Vertical Format Unit (VFU) and	5-39
Slew Strobe Assembly—Method A, Adjustment of	5-42
Slew Strobe Assembly—Method B, Adjustment of	5-42
Slewing, Paper	1-4
Solenoid, Linefeed	5-65
Spacing, Character	1-4
Spacing, Line	1-4
Specifications	1-2
Spring, Hammer Return	5-56
Springs, Ribbon Cartridge Support	5-61

	PAGE
Status Indicators	5-11
Strapping Options	5-8
Straps (INT/2)	4-38
Straps (LHD)	4-14
Straps (PSR)	4-21
Straps (LOG)	4-23
Straps (XPS)	4-35
Strobe Detector Assembly, Replacement of	5-42
Strobe Disc Assembly, Line Feed Clutch and	5-63
Supplies, Expendable	2-1
Supply, Power	2-1
Supply, Power	5-48
Switches and Indicators	3-1
Switch, Paper Out	5-36
Switch, Top Cover Interlock	5-37
Switches and Indicators	5-39
Switch, Run/Load	5-39
Switch, Power	5-47
Synchronization, Printer	1-2
Synchronizing VFU Tape with Form	5-42
System Compatibility	2-1
Tension, Paper	4-8
Terms, Definition of	A-1
Test Equipment, Tools and	5-2
Test Feature, Self	4-3
Test Points and Waveforms (HVS)	4-11
Test Points and Waveforms (LHD)	4-14
Test Points (PSR)	4-21
Test Points and Waveforms (LOG)	4-23
Test Points and Waveforms (XPS)	4-35
Test Ponts (INT/2)	4-38
Test, VFU	2-12
Test, Self	5-10
Timing (Phasing Adjustment), Photocell	5-62
Toggle Assembly	5-33
Tools and Test Equipment	5-2
Top Cover Interlock Switch	5-37
Tractor Adjustment, Vernier	4-8
Tractor, Paper Handler	5-30
Tractors, Converting	5-31
Tractor Drive Shaft Gear and Bearing	5-33
Transfer, Data	4-2
Troubleshooting	5-7
Troubleshooting Guide	5-14
Troubleshooting, LHD Printed Wire Board (PWB)	5-22

INDEX (Continued)

	PAGE
Unpacking	2-1
Unpacking Instructions	2-2
Use, Preparation for	2-9
Vernier Tractor Adjustment	4-8
Vertical Format Unit (VFU) Option	1-4
Vertical Format Unit Option	3-1
Vertical Formatting	4-9
Vertical Format Unit (VFU) and Slew Strobe Assembly	5-39
Vertical Adjustment of Magnetic Belt Guide	5-53
VFU Paper Tape, Preparing the	3-5
VFU Replacement	5-39
VFU Tape with Form, Synchronizing	5-42
VFU Test	2-12
VFU to Mother Board Connections	5-21
VFU, Adjustment of the	5-40
Visual Inspection	5-1
Weight, Size and	1-2
XPS, Power Control Board	4-35
6 or 8 Lines per Inch Option	3-8

CHAPTER 1

INTRODUCTION

GENERAL DESCRIPTION

The TermiNet 340 Family of Line Printers (the TermiNet 340 Line Printer is illustrated in Figure 1-1) is designed to provide the line printer function in data communication systems. This printer family uses the USASCII data communications code to print up to 340 lines of data per minute, depending upon which model in the family is being employed.

This manual is written to cover servicing of all of the models in the TermiNet 340 Family of Line Printers (i.e., models 310, 320, 330, and 340). The term TermiNet 340 Line Printer is used throughout this manual to refer to all of the models.

The main difference which exists in the various line printer models is the lines per minute speed at which they operate. Any other differences which exist are discussed where applicable.

Printer design is primarily electronic, with a minimum number of moving parts. The logic rack (bustle) is installed in a pedestal mounted bustle with the main power components located within the printer frame. The TermiNet 340 Line Printer prints out on a single or multiple part, continuous pin feed, edge punched paper.

PRINT MECHANISM

The printer uses a belt printing concept to achieve its high speed and reliability. A belt carrying print fingers rotates horizontally past a bank of hammers. Each finger has a type character or symbol embossed on the upper end. There are two complete sets of characters (type fonts) on the belt. Optional three or four font print belts are also available.

Printing takes place by firing a hammer at the correct time to hit the selected print finger to be

PLH 8037

Figure 1-1. TermiNet 340 Line Printer

printed. The print finger is driven against the ribbon and paper to accomplish the printing process. The print finger and hammer rebound back to their correct positions after contacting the platen.

PRINTER SYNCHRONIZATION

Precise synchronization permits the belt printing concept to work. The printer's electronics compares the positions of the print fingers in front of the hammers. The hammer is fired when the selected print finger is in the correct position. Timing and synchronization of the comparison process is maintained by means of timing pulses. Timing pulses are generated as each print finger passes a photocell; thus, the control logic is continuously informed of the position of the print fingers with respect to the hammers.

ELECTRONIC LOGIC MODULE

The main electronic logic module (bustle) is mounted in the printer pedestal. The bustle contains large-scale integrated circuits on printed wire boards to provide the necessary circuits for printer operation. The printed wire boards are designed for interchangeability to keep maintenance and service to a minimum. The logic circuits are designed so that most of the basic functions are on one printed wire board. The function of certain printed wire boards can be changed by changing wire straps (see Strapping Options, Chapter 5 - Troubleshooting).

In addition to the pedestal mounted electronic module (bustle), the printer contains one additional printed wire board located on the main frame of the printer. This board provides the power control for the printer and is located under the top cover above the power transformer assembly.

SPECIFICATIONS

CODE COMPLIANCE

The TermiNet 340 Line Printer conforms to the standard seven bit USASCII code with the eight bit reserved for parity (optional). This code is illustrated in Figure 1-2.

SIZE AND WEIGHT

Dimensions and weight of the TermiNet 340 Line Printer are as follows:

Width	26.14 in.	(66.4 cm)
Depth (w/o Paper Rack):	21.54 in.	(54.7 cm)
Depth (incl. Paper Rack):	29.32 in.	(74.2 cm)
Depth (incl. Optional Paper Shelf):	35.47 in.	(90.1 cm)
Depth (w/Optional Paper Shelf at Max. Ext.)	37.97 in.	(96.4 cm)
Height (w/o Paper Rack):	36.16 in.	(91.8 cm)
Height (incl. Paper Rack):	37.80 in.	(96.0 cm)
Height (with top open):	48.39 in.	(122.9 cm)
Weight (approximate)	135 lb.	(61.2 kg)

Bits b_7 b_6 b_5 →	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b_4 b_3 b_2 b_1 ↓ Row / Column →	0	1	2	3	4	5	6	7
0 0 0 0	0	NUL	DLE	SP	0	@	P	`	p
0 0 0 1	1	SOH	DC1	!	1	A	Q	a	q
0 0 1 0	2	STX	DC2	"	2	B	R	b	r
0 0 1 1	3	ETX	DC3	#	3	C	S	c	s
0 1 0 0	4	EOT	DC4	$	4	D	T	d	t
0 1 0 1	5	ENQ	NAK	%	5	E	U	e	u
0 1 1 0	6	ACK	SYN	&	6	F	V	f	v
0 1 1 1	7	BEL	ETB	'	7	G	W	g	w
1 0 0 0	8	BS	CAN	(	8	H	X	h	x
1 0 0 1	9	HT	EM	)	9	I	Y	i	y
1 0 1 0	10	LF	SUB	*	.	J	Z	j	z
1 0 1 1	11	VT	ESC	+	,	K	[	k	{
1 1 0 0	12	FF	FS	,	<	L	\	l	¦
1 1 0 1	13	CR	GS	-	=	M	]	m	}
1 1 1 0	14	SO	RS	.	>	N	^	n	~
1 1 1 1	15	SI	US	/	?	O	_	o	DEL

MSC-3002

Figure 1-2. American Standard Code for Information Interchange (ASCII) Code Chart

ENVIRONMENT

Avoid installing the printer in hot, humid, or dusty areas.

Environmental specifications are as follows:

Temperature

Operating: +32°F (0°C) to +110°F (43.5°C)
Storage: −20°F (−29°C) to +160°F (71°C)

Relative Humidity

Operating: 10% to 95% non-condensing
Storage: 10% to 95% non-condensing

Altitude

Operating: 0 to 12,000 feet (3,660 m)
Non-operating: 0 to 50,000 feet (15,260 m)

INPUT POWER

117V AC ±10%, single phase, 50 or 60 Hz.

Models containing the multivoltage transformer will also accept input voltages of 100, 200, 220, or 240V AC. Power consumption is:

Standby — 90 watts nominal
Printing — 350 watts nominal

PAPER HANDLING

Paper is supplied to the printer from a box or tray located at the front of the printer containing continuous folded sheets or multi-form sets. The printer has an adjustable paper tractor for use with individual form sets or other standard edge punched paper. The printer will handle paper up to 14.875 inches (37.8 cm) wide. Form sets consisting of up to six parts having a maximum thickness of 0.025 inch (0.64 mm) may be accommodated.

NOTE

Single ply paper may also be fed to the printer from the rear.

PRINT LINE LENGTH AND PRINTING SPEED

Table 1-1 details typical printing line lengths and speeds of the various models of the TermiNet 340 family of Line Printers.

TABLE 1-1
PRINTING SPEEDS

LINE PRINTER MODEL	HAMMER HIT LIMIT	CHAR/SEC LIMIT	FONTS ON PRINT BELT	AVERAGE LINES PER MINUTE PRINTING SPEED	
				MINIMUM	MAXIMUM*
310	8	200	2	90	240
320	8	255	2	115	240
330	8	400	2	180	240
340	30	510	2	230	240
310	8	200	3	90	240
320	8	255	3	115	300
330	8	400	3	180	340
340	30	510	3	230	340
310	8	200	4	90	240
320	8	255	4	115	300
330	8	400	4	180	425
340	30	510	4	230	425

*Maximum values are based on an average line density (printable characters/line) of 50 characters. Minimum values are based on line densities of 132 characters.

DATA INTERFACE

Data is transferred bit parallel, character serial to the printer from the data source through a 25-pin connector. An optional serial interface is also available.

PRINT CHARACTER SET

The standard two font print belt contains two character sets consisting of the 94 print characters defined in the USASCII set (less control codes), including both upper and lower case alphabet.

The optional three or four font print belt contains three or four character sets (fonts) consisting of 64 and 48 print characters respectively (excluding lower case alphabet).

PRINT CONTROL

The buffer print memory is loaded at a rate determined by the data source driving the printer's interface.

A READY signal from the printer permits the data transfer cycle. The data transfer is terminated by a control signal from the data source to the printer. The transfer can also be terminated by the printer when a full line of data has been received. Data transfer is expected to require no more than the 25 millisecond line feed period. However, if the data source is slow, a longer transfer period can be accommodated with the resulting reduction in print rate. Printing of the line begins at the completion of the data transfer cycle.

A low belt speed sensor started by the MOTOR ON command prevents printing while the print belt is accelerated up to speed.

CHARACTER SPACING

Horizontal, 10 characters per inch

LINE SPACING

6 lines per inch. Optional 6 or 8 lines per inch models are also available.

PARITY

Straps are provided on the INT board to set the printer logic to check the incoming data for even, odd, or no parity. A parity error symbol will be printed when a parity error is detected.

VERTICAL FORMAT UNIT (VFU) OPTION

The TermiNet 340 Line Printer is available with the paper tape VFU option to provide automatic vertical line spacing on preprinted forms. The VFU option uses a standard one-inch wide, eight-channel paper tape with 1/10 inch pitch sprocket holes between channels 3 and 4.

PAPER SLEWING

Whether or not the VFU option is installed, if the optional paper slewing device is installed paper can be slewed by appropriate commands from the data source at a rate of 8.2 inches per second.

The first character of a data transfer cycle is for paper control and will not be counted as a print character. If bit seven of the paper control character is a logic one, then the six lower bits determine the number of lines that paper will slew (0 to 63). If bit seven is a logic zero, then bit six will determine whether the Vertical Format Unit (if installed) will execute a form feed or a vertical tab.

FORMS POSITIONING

A vernier tractor adjustment is provided to allow exact horizontal positioning of forms in the printer. Forms may be positioned accurately in the vertical position by pushing in and rotating the platen knob in either direction. These features are not included in printers of early manufacture.

PAPER TENSION CONTROL OPTION

The paper tension control option can be added to the toggle assembly on any TermiNet 310/320/330/340 Line Printer. The addition of this feature will allow the toggle assembly to apply a controlled tension on single part paper. This controlled tension is applied when the paper has been properly installed in the Printer and when the RUN/LOAD lever has been placed in the RUN position. The exerted tension should aid in ensuring smooth, even paper flow during a paper moving operation.

Instructions for installation of the paper tension control option are provided in Chapter 5.

RIBBON CARTRIDGE

The ink ribbon cartridge contains a 0.75 in. (1.9 cm) wide continuous loop of ribbon configured as a Mobius strip. This configuration allows complete use of the entire ribbon area. Whenever ribbon replacement becomes necessary, the entire cartridge may be replaced with a fresh unit.

RE-INKER

An optional re-inker is available. The re-inker attaching to the left side of the ribbon cartridge, contains an ink reservoir and wick. The re-inker should be used for refreshing the ink ribbon when printing intensity begins to fade. When the ribbon has been refreshed with a new supply of ink from the re-inker, the operator may remove it until it is needed again.

MODEL NUMBER

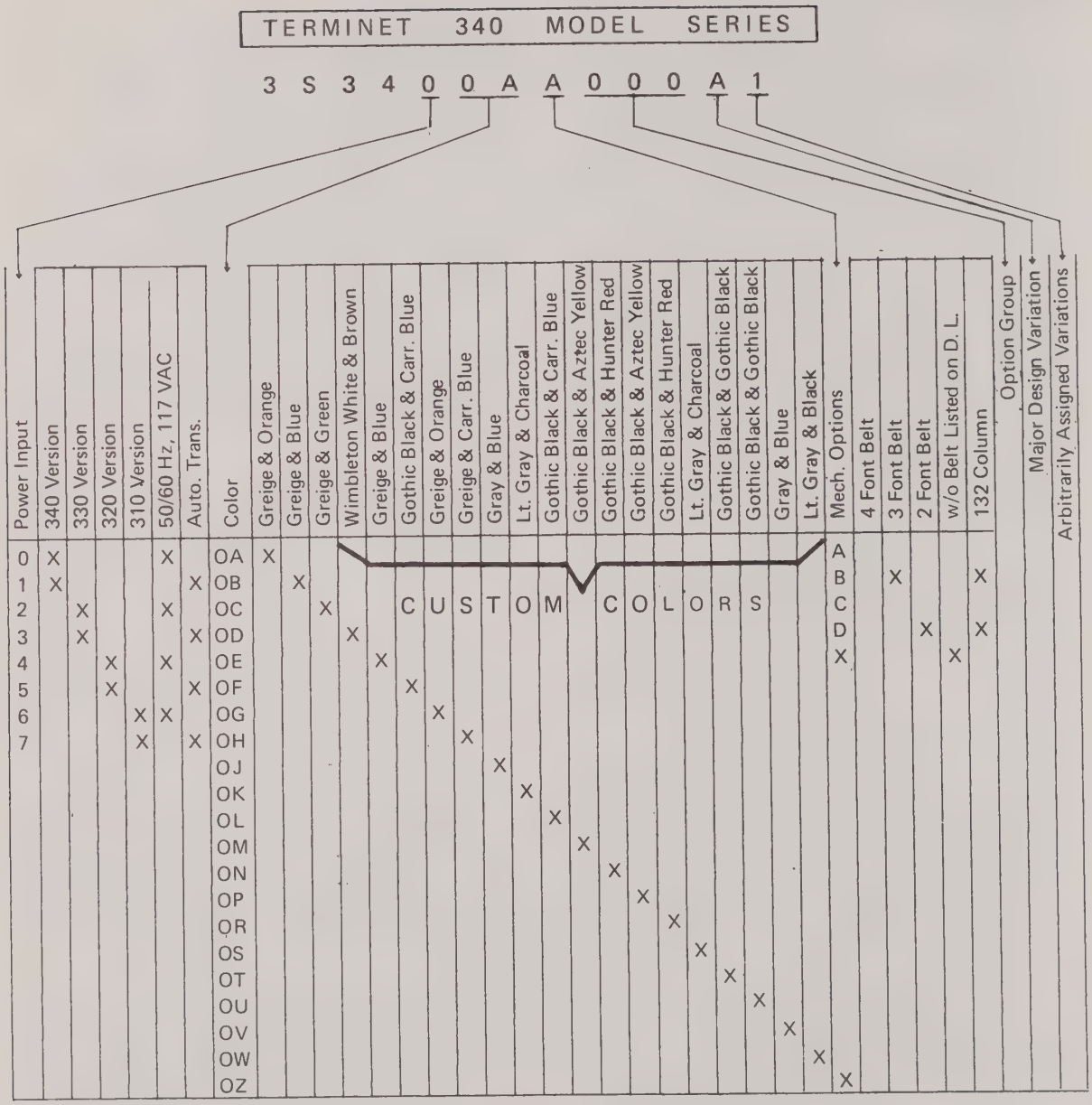
The model number of the printer is coded to indicate model and options. Figure 1-3 is a chart that illustrates how to interpret the code.

For example, printer model number 3S3400AB-000A1 would describe a TermiNet 340 Printer designed to be used with 60 Hz 120V input power, finished in greige and orange paint, containing a 3 font print belt, and having 132 columns. The "000" in the model number represents a particular group of options installed on the printer at the factory. Finally, the A1 in the model number represents model changes and variations within each model change.

SERIAL NUMBER

The nameplate on the printer frame shows both model number and serial number. The serial number is a ten digit number broken down as follows:

First two digits	—year of manufacture.
Second two digits	—fiscal week of manufacture.
Fifth digit	—equipment type.
Last five digits	—manufacturing sequence number.



NOTE—CERTAIN CUSTOM MODELS NOT INCLUDED IN ABOVE CHART

Figure 1-3. TermiNet 310/320/330/340 Line Printer Model Number Code Chart

CHAPTER 2

INSTALLATION AND CHECKOUT

SECTION 1

INSTALLATION

PREPARATION FOR INSTALLATION

OPERATING AREA PREPARATION

Arrange in advance an appropriate location for the TermiNet 340 Line Printer. A floor area about four feet wide and three feet deep is required to permit cleaning, ventilation, and access to paper handling racks and trays.

POWER SUPPLY

The standard TermiNet 340 Line Printer requires 117 volts (±10%), 50/60 Hz (+1, −1-1/2 Hz). (The printer is designed for both 50 and 60 Hz operation.) The printer nominal power ratings are 90 watts standby, and 350 watts printing. The printer power cable is 8 feet (2.44 m) long, three-conductor, with attached grounding type lug.

An AC power outlet supplying correct voltage, current, and frequency must be available within six feet (1.83 m) of the printer. This AC power source must be properly grounded in accordance with recognized good safety practices. In addition to personnel safety considerations, an AC power source not grounded in accordance with recognized good safety practices may cause erroneous equipment operation and could result in damage to the equipment.

NOTE

Read model number nameplate on specific equipment (see Chapter 1 for model and options coding). Some optional special models operate at different voltages and frequencies.

Also avoid using circuits serving other devices which may cause chronic low voltage and introduce noise, and circuits with heavy equipment whose starting may cause voltage dips and fluctuations.

SYSTEM COMPATIBILITY

Before installation, check that interfacing equipment (computer, parallel interface lines, etc.) is compatible with the TermiNet 340 Line Printer.

EXPENDABLE SUPPLIES

A supply of fuses, ribbon cartridges, paper, forms and other expendables should be kept on hand by the customer. Detailed information on expendable items is provided in Ordering Supplies for your New TermiNet Data Communication Equipment, GEJ-2748. This brochure is included in the shipping package.

NOTE

Spare parts, ribbon cartridges, and non-standard items which are supplied by General Electric Company may be ordered from:

Data Communications Products
Business Department
Parts Administration Unit
General Electric Company
Waynesboro, Virginia 22980

UNPACKING

SHIPPING MATERIAL

The printer and pedestal are packaged in one shipping carton, together with two accessory parts boxes containing paper handling equipment, an ink ribbon cartridge, vinyl dust cover, cables, and instruction manuals. The printer is protected against shipping damage by several molded polyurethane pieces (see Figure 2-1).

If any shipping or handling damage is found upon delivery or during unpacking, immediately notify carrier. If any equipment is missing or incorrect, notify General Electric Company, Data Communication Products Business Department, Waynesboro, Virginia 22980 (Telephone: 703/949-1000).

UNPACKING INSTRUCTIONS

NOTE

Retain shipping carton and packing material for use in reshipping printer.

1. With shipping carton right side up, cut banding straps around outer carton (Figure 2-1-1).
2. Open top flaps of carton and remove accessory parts box at rear of printer (Figure 2-1-2).
3. Lift up and remove main body of outer shipping carton. This part of carton will fold flat for easy storage (Figure 2-1-3).
4. Remove the two polyurethane supports near top of printer (Figure 2-1-4).
5. Remove accessory parts box located near front of printer (Figure 2-1-5).
6. Remove polyurethane protective pieces from each side of printer (Figure 2-1-6).
7. Remove plastic sheet from around printer and pedestal.
8. Carefully lift printer and pedestal up from bottom part of shipping carton (Figure 2-1-7).

WARNING

PRINTER AND PEDESTAL ASSEMBLY WEIGHS APPROX. 135 POUNDS (61.2 KILOGRAMS).

9. Remove power cord, paper handling equipment, and other miscellaneous items from the accessory parts boxes.
10. Remove protective paper from under top cover of printer.
11. To repackage printer, reverse the order of the steps illustrated in Figure 2-1.

CAUTION

Due to the long length and weight of the line printer platen, it is not installed in the printer when shipped from the factory.

It has been found that during transit, rough handling or severe impacts can cause the platen to unseat and cause damage to the platen itself or to the printer mechanism.

When the printer is being packed for reshipment, the platen should always be removed from the Printer and packaged separately.

INSTALLATION

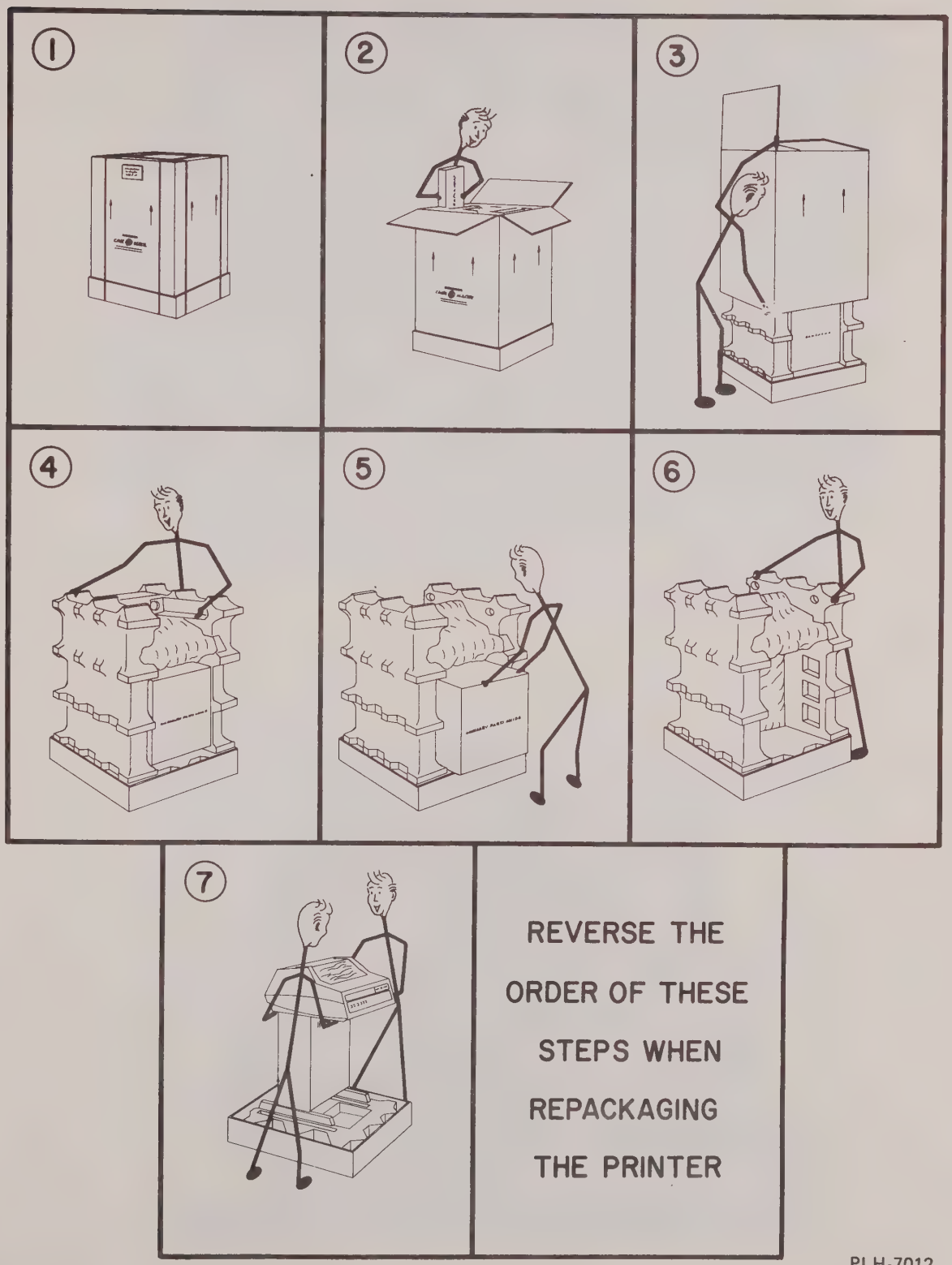
With the TermiNet 340 Line Printer removed from its shipping carton, proceed as follows:

1. Place printer and pedestal assembly on firm, flat surface in well-lighted area.

NOTE

Leveling feet on bottom of pedestal are preset at the factory. However, if floor is uneven at printer location, adjust leveling feet as necessary to achieve stable support. Locking nuts on leveling feet must be tightened after adjustment is complete.

2. Raise printer hinged top cover. Lift at ridges on sides of top cover.
3. Make certain that drive belts are in place and routed properly (see Figure 2-2).
4. Check that motor pulley at right rear of printer is correctly installed for input frequency to be used as shown on Figure 2-2. (See NOTE following step 13.)
5. Make certain that print belt turns freely by hand.



PLH-7012

Figure 2-1. Printer unpacking Procedure

6. Install the platen assembly, as follows:

   (a) Unwrap platen assembly.

   (b) Open platen latches (right side and left side of printer, see Figure 2-2), install platen and close latches.

7. Install the ink ribbon cartridge in accordance with instructions in a subsequent paragraph in this chapter.

8. Close the printer cover.

9. Install paper rack assembly on top of printer by hooking the two loops on the rack over the studs located in the top cover flanges.

10. If an international power supply with multivoltage transformer (44C414423-G03) in the Pedestal is used, proceed as follows (refer to Figure 2-3):

    WARNING

    Be sure power line cord is not connected to a local power source before proceeding.

    (a) Remove pedestal rear panel.

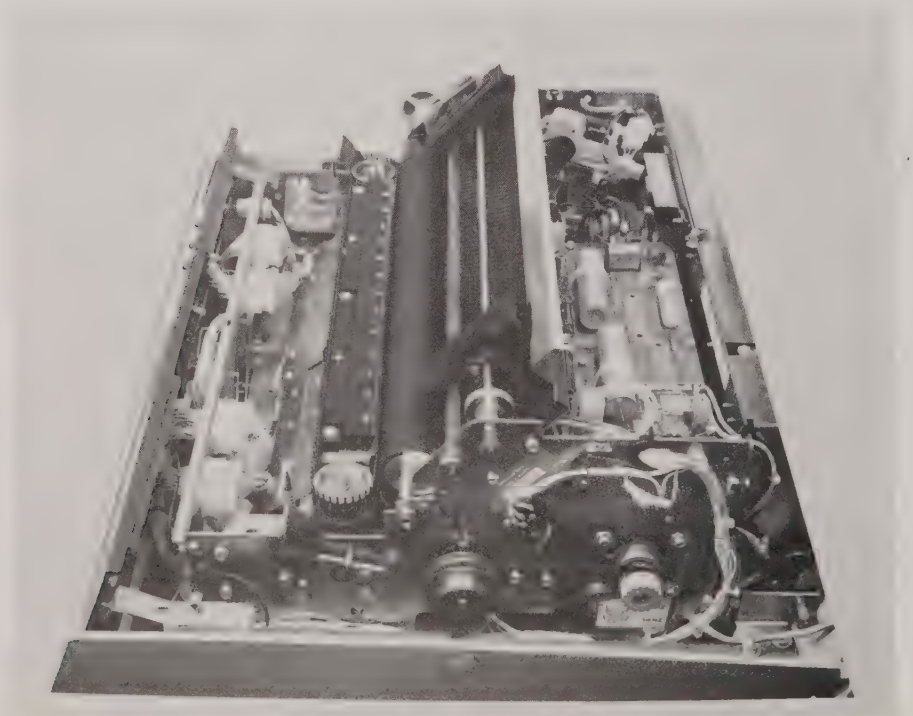
    (b) Remove WARNING plate (secured by two screws) from multivoltage transformer in lower left corner of pedestal (facing rear of pedestal). A small terminal board is now visible.

    (c) Remove tape from disconnected brown wire and connect to voltage tap on terminal board which matches local supply line voltage (terminals 1-5).

    (d) Where local electrical codes require a neutral fuse, remove jumper from terminal positions 9 and 10. Where neutral fuse is not required, leave jumper in place as shown in Figure 2-3. Check that line fuse and neutral fuse (where required) are securely installed in fuse holders.

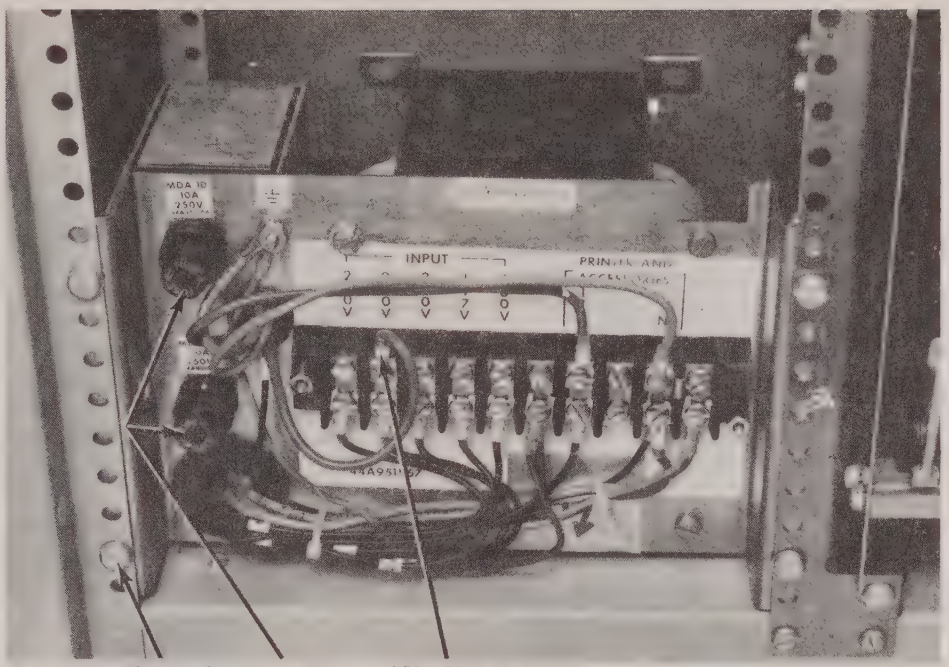
    (e) Replace WARNING plate removed in step b above, and pedestal cover removed in step a above.

11. The printer is shipped with a rear low paper sensor installed, but disabled. To enable the



PLH 8038

Figure 2-2. Right Side — TermiNet 340 Line Printer



PLH 5007

Figure 2-3. Multivoltage Transformer — Front View

rear low paper sensor, should the customer desire the feature, remove the sensor enabling plug (attached to the front bottom left of the printer) from the printer mounted jack. Conversely, to disable the rear low paper sensor, insert the sensor enabling plug in the jack.

12. The internal cable and jack for an optional front low paper sensor is shipped installed in the printer. If the optional front low paper sensor kit is to be installed, proceed as follows:

    (a) Attach right and left brackets to rod using two No. 8-32 × 1/4 in. pan head screws. (Bracket angles are at outer sides.)

    (b) Using four No. 8-32 × 1/4 in. pan head screws and four No. 8 flat washers, attach brackets to existing vent slots on front pedestal panel. Use outer left vent slot and fourth vent slot in from right side.

    (c) Snap switch and guide assembly onto rod.

    (d) Remove the rear low paper sensor enabling plug, if inserted, and connect the front low paper sensor plug in its place.

    NOTE

    Connecting this plug automatically disables the rear low paper sensor.

13. If applicable, secure optional paper shelf in back of pedestal by hooking it over studs protruding from sides of pedestal.

REVERSAL OF DRIVE MOTOR PULLEY

NOTE

For 60 Hz input power, the smaller diameter side of the pulley must be positioned inboard (next to motor) to drive the belt.

For 50 Hz input power, the larger diameter side of the pulley must be positioned inboard to drive the belt.

If drive motor pulley reversal is necessary to accommodate local power supply, proceed as follows (see Figure 2-2 for component locations):

1. Open printer cover.
2. Loosen the four motor mounting screws.
3. Loosen the two motor pulley set screws and remove pulley from motor shaft.
4. Reverse pulley and reinstall on shaft; tighten the two motor pulley set screws.
5. Slip drive belt over correct diameter motor pulley and position drive belt parallel to side of printer frame. Adjust for correct belt tension by moving motor toward front or rear of printer. Tighten motor in place while holding belt tension as follows:

   A 4 ounce (114 gm) load deflects belt 0.05 to 0.225 inch (1.3 to 5.7 mm). Load should be applied perpendicular to belt at mid-span.

6. Tighten all four motor mounting screws evenly, one turn at a time. Do not tighten any one screw completely before tightening the others an equal amount.

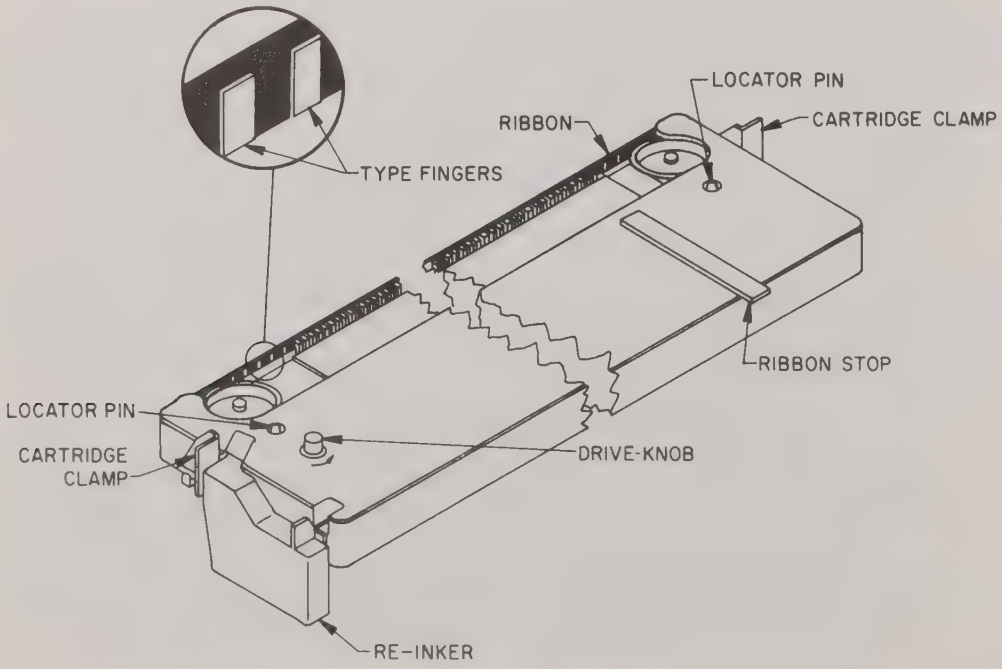
INK RIBBON CARTRIDGE AND RE-INKER INSTALLATION

Install Ink Ribbon Cartridge with Re-inker (44A419819-G03) or without Re-inker (44A419819-G04) as follows (refer to Figure 2-4).

CAUTION

Printer can be damaged by incorrect installation.

1. Raise printer top cover.
2. Place printer RUN/LOAD lever in RUN position.



PLH-7014

Figure 2-4. Ribbon Cartridge Installation

3. Prior to insertion of ink ribbon cartridge, rotate drive knob in counterclockwise direction to insure that ribbon is taut.

4. Load cartridge onto the two locator pins and press down on four corners of cartridge until cartridge clamps snap into place. Rotate carriage knob clockwise during loading to insure engagement with drive spindle.

5. Inspect all type fingers to insure that they are on same side of ribbon as shown. Manually rotate the drive belt CCW at the right side of the printer to ensure that the print fingers are free of the ribbon to prevent snagging.

6. If all type fingers are not on same side, release cartridge clamps, lift off cartridge and repeat steps 3 through 5.

7. Remove ribbon stop from cartridge.

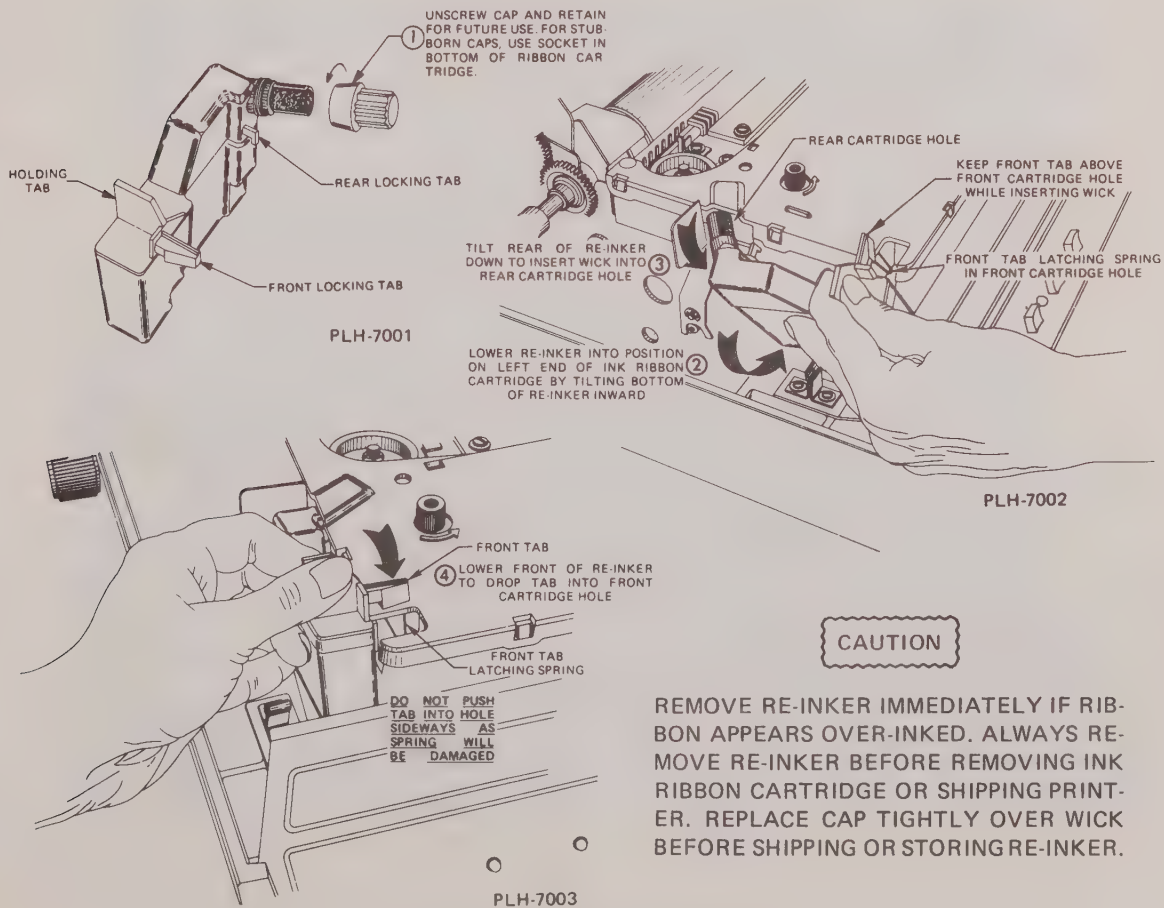
NOTE

To remove a used cartridge, first remove re-inker if one is installed, then release cartridge clamps, and lift off used cartridge as in step 6 above.

8. Install re-inker on cartridge in accordance with Figure 2-5. (Instructions are also on the cartridge box.) Observe CAUTION in Figure 2-5. Close cover, press MOTOR ON switch, and check for normal movement of type fingers and ribbon.

PAPER INSTALLATION

The TermiNet 340 Line Printer prints on single or multiple-part, continuous pin feed, edge punched paper. The tractor is variable to handle paper widths from 3 inches (7.6 cm) to 14.875 inches (37.8 cm). Paper loading may be accomplished


UNSCREW CAP AND RETAIN FOR FUTURE USE. FOR STUB-BORN CAPS, USE SOCKET IN BOTTOM OF RIBBON CARTRIDGE.
1
HOLDING TAB
REAR LOCKING TAB
FRONT LOCKING TAB
PLH-7001
REAR CARTRIDGE HOLE
KEEP FRONT TAB ABOVE FRONT CARTRIDGE HOLE WHILE INSERTING WICK
TILT REAR OF RE-INKER DOWN TO INSERT WICK INTO REAR CARTRIDGE HOLE
3
FRONT TAB LATCHING SPRING IN FRONT CARTRIDGE HOLE
LOWER RE-INKER INTO POSITION ON LEFT END OF INK RIBBON CARTRIDGE BY TILTING BOTTOM OF RE-INKER INWARD
2
PLH-7002
FRONT TAB
4
LOWER FRONT OF RE-INKER TO DROP TAB INTO FRONT CARTRIDGE HOLE
FRONT TAB LATCHING SPRING
DO NOT PUSH TAB INTO HOLE SIDEWAYS AS SPRING WILL BE DAMAGED
PLH-7003

CAUTION

REMOVE RE-INKER IMMEDIATELY IF RIBBON APPEARS OVER-INKED. ALWAYS REMOVE RE-INKER BEFORE REMOVING INK RIBBON CARTRIDGE OR SHIPPING PRINTER. REPLACE CAP TIGHTLY OVER WICK BEFORE SHIPPING OR STORING RE-INKER.

Figure 2-5. Re-inker Installation

from front or rear of printer, as follows (see Figure 2-6):

1. Place paper supply at front or rear of printer as desired.

2. Push paper loading lever down to LOAD position.

3. Feed paper into front or rear of printer. If multiple form sets are used, they should be loaded only into the front of the printer with the shiny side of their carbon paper toward the rear of printer.

NOTE

Be sure paper slides over paper out switch and not beside it, since paper cannot be moved laterally onto the switch.

4. Continue feeding paper until it appears in front of platen. Raise clear plastic paper shield and pull enough paper through to reach beyond tractors. Be sure paper alignment is straight with respect to printer.

5. Release tractors by pushing down on small tractor lever. Slide tractors to left or right as required to align with paper width being used.

6. Install paper on tractor pins, then close tractor covers and lock in place by pushing up on small tractor levers.

7. Push up on paper loading lever to RUN position.

8. Close clear plastic paper shield.

NOTE

Precise vertical positioning of the form is possible by pushing the platen knob in and slightly rotating the knob in either direction to advance or backup the form as required. Precise horizontal form positioning is accomplished by rotating the thumbwheel located on the right end of the round tie rod extending through the forms tractor. These adjustment features are not applicable to early production models.

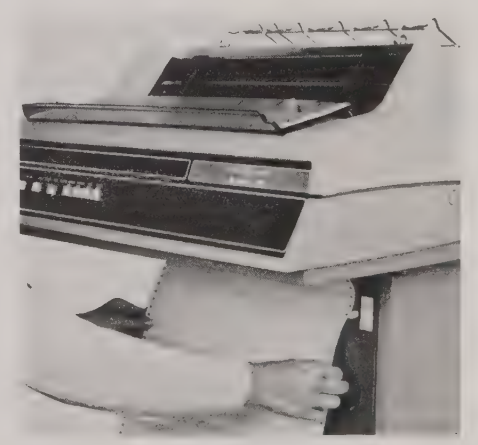
9. Check that paper is in correct alignment with paper rack on top of printer so that paper can slide smoothly along rack during printer operation.

NOTE

If paper tearing or jamming occurs when running multi-part forms, replace toggle assembly (44B500709-G01) with newest version.

PLH 8039

Rear



PLH 8040

Front

Figure 2-6. Printer Paper Loading

PREPARATION FOR USE

1. Check that power switch on pedestal is OFF, then check the following:

   a. If other than standard 117V AC power supply is being used, multivoltage transformer connections have been accomplished in accordance with procedures previously described.

   b. Correct diameter side of drive motor pulley is being used for the local supply frequency available.

   c. Ink ribbon cartridge and re-inker is installed.

   d. Paper is installed.

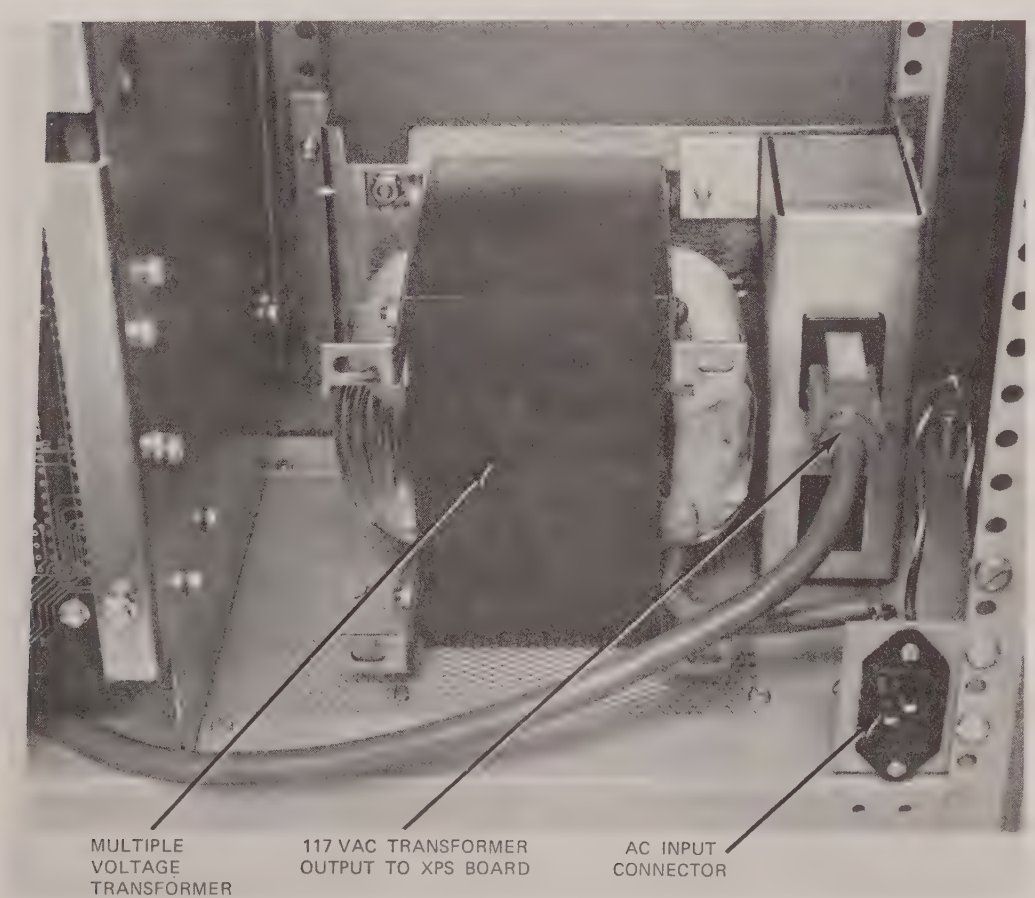
NOTE

Since TEST pushbutton operates all 132 columns, be sure that 132 column width paper is used for checkout.

2. Connect or simulate data source, as required.

CAUTION

Exercise care when connecting the data cable connector to the mother board. Tighten the attaching screws to a torque value of no more than 2 in.-lb (2.29 Kg-cm) maximum. In lieu of a torque wrench, a screwdriver with a handle no larger than 1.0 in. (2.5 cm) diameter can be used. Seat the screws only to a point that slight resistance is noted.



PLH 5014

Figure 2-7. Multivoltage Transformer — Rear View

NOTE

Checkout procedures are provided for applicable interface configurations in the OPERATIONAL CHECKOUT procedure.

3. 117V AC Local Power Supply: Connect male end of three-conductor power cord to properly grounded 117V AC power source.

   Other than 117V AC Local Power Supply:

   a. Ensure that steps 1a and 1b have been accomplished.

   b. Remove rear panel from pedestal and connect male end of printer power cord to multivoltage transformer plug as shown in Figure 2-7.

   c. Replace rear panel of pedestal.

   d. Attach the three spade connectors at other end of power cord to locally required connector (color code: Brown = Phase, Blue = Neutral, Green with yellow stripe = earth).

   e. Connect to properly grounded local power source.

SECTION 2

CHECKOUT

This section contains checkout procedures for the TermiNet 340 Line Printer. It also contains information for checking the various interface circuits which may be used in different printer configurations. In following this procedure, skip any steps which are not applicable to the particular Printer being checked out. The chart shown below lists the various interface circuits which may be installed in the printer.

TABLE 2-1
LINE PRINTER INTERFACES

INTERFACE NO.	DESCRIPTION
1	Standard Parallel Interface
2	Buffered Parallel Interface
3	Unbuffered Parallel Interface
4	Buffered Closed Loop Serial Interface
5	Unbuffered Closed Loop Serial Interface

CHECKOUT PROCEDURE

1. After completing procedures under PREPARATION FOR USE, set power switch on front of pedestal to ON position. Three fans begin operating (front of printer, rear of printer, bottom of pedestal).

   NOTE

   Printer will not operate unless top cover is down, paper out switch is activated, and print belt is up to speed. Also, a paper tape must be installed in the VFU for proper operation of the vertical formating codes (VT or FF).

2. Press MOTOR ON pushbutton. Motor starts and, on Interface 1 only, MOTOR ON indicator lights.

3. Press TEST pushbutton for approximately 5 seconds. Alphabet, numerals, and symbols test series is printed out in sequential counting order of the ASCII code as long as TEST pushbutton is pressed down. Line feed operates automatically.

4. Press MOTOR OFF pushbutton. Motor stops and, on Interface 1 only, MOTOR ON indicator goes out. Fans continue to operate.

5. Interfaces 1, 3, and 5 only: Press MOTOR ON pushbutton, as in step 2 above. All Interfaces: Press LINE FEED. On Interfaces 2 and 4, motor starts. On all interfaces, paper advances one line each time the pushbutton is pressed.

6. Tear off paper entering printer at paper perforation nearest point of entry. Use LINE FEED pushbutton to advance paper until low paper condition is sensed. The result of this action varies with the interface arrangement, as follows:

   a. Interface 1: The LPFP signal is switched high at the interface to the data source. No direct action is taken by the printer and printing may continue until the paper-out sensor is activated.

   b. Interfaces 2 and 4: Paper out alarm is activated, lighting the ALARM indicator.

   c. Interfaces 3 and 5: PAPER OUT indicator is lit and BUSY signal indicates data cannot be received. Now Press FORMS OVERRIDE pushbutton. Paper advances until paper out sensor (below print hammers) is activated (or until in-process form is completed as sensed from a VFU paper tape).

7. Reinstall paper in printer. ALARM indicator or PAPER OUT indicator goes out, as applicable. Press MOTOR ON pushbutton. Where applicable, motor starts. Then press LINE FEED pushbutton several times. Paper advances one line at a time, as at the end of step 5 above.

8. Interfaces 2 and 4 only: Press ON LINE pushbutton. ON LINE indicator lights and Printer goes into an on-line condition, ready to accept data from data source.

9. Interfaces 2 and 4 only: Press LOCAL pushbutton. ON LINE indicator goes out and printer goes into a local condition, unable to accept data from data source.

10. Interfaces 3 and 5 only: Press SELECT pushbutton several times. This alternately sets and resets a flip-flop controlling the SLCT signal. When in the set condition (signal at high level, printer in selected or ready condition), SELECT indicator is lit. When in the reset condition (signal at low level, printer unable to receive data), SELECT indicator goes out.

VFU TEST

11. Install supply of user's forms in printer.

12. Lift printer top cover. Then lift VFU paper tape cover on left side of printer and install a prepared tape in the VFU mechanism. Close VFU paper tape cover and printer top cover.

NOTE

For VFU tape preparation instructions and VFU operating instructions, see TermiNet 340 Line Printer Operator's Manual, GEK-49264, or Chapter 3 of this manual.

13. For interfaces 1, 2, and 5 Only: Press MOTOR ON pushbutton. Motor starts and, on Interface 1 only, MOTOR ON indicator lights.

14. Press FORM FEED pushbutton (Interfaces 1, 2, and 4) or TOP OF FORM pushbutton (Interfaces 3 and 5). This advances paper to next hole punched in Channel 1 of the VFU paper tape loop (i.e., top of next user's form).

NOTE

Steps 15-20 require that customer's data source be connected to printer.

15. Using appropriately punched VFU paper tape (installed in step 12) and input data from user's data source, print out information on forms. Data should print out correctly. (If form aligns incorrectly with data, inspect punched paper tape for error.)

16. For Interface 3 and 5 only: Tear off form entering Printer at form perforation nearest point of entry. Press TOP OF FORM pushbutton. Form advances only until it reaches appropriate (i.e., front or rear) low paper sensor. Press FORMS OVERRIDE pushbutton. In-process form will complete its printout, then printer will stop.

17. Repeat step 7.

ADDITIONAL OPERATIONAL CHECKOUT INFORMATION

18. Interfaces 1, 2, and 4 Only: READY indicator is lit by data source as required to signal the operator. For Interface 1, the READY indicator is lit when the RTP signal is held at a high level; for Interfaces 2 and 4, the READY indicator is lit when the RTP signal is held at a low level.

19. Interface 1 Only: INTERRUPT pushbutton, when pressed, provides a high level signal at the interface to the data source, as required. The printer logic does not respond to this pushbutton.

20. Interface 1 Only: HERE IS pushbutton, when pressed, provides a high level signal at the interface to the data source, as required. The printer logic does not respond to this pushbutton.

21. All Interfaces: Turn power switch on front of pedestal to OFF position. Motor and all three fans cease operation. Printer is inoperative.

WARNING

Always disconnect main power cord from local supply before removing pedestal panels.

OPERATOR INSTRUCTION

Instruct operator in the following:

1. Use of control panel pushbuttons.

2. Changing of paper and ribbon cartridge with re-inker.

3. Use of VFU for printing forms.

4. Procedure for replacing print fingers.

CHAPTER 3

OPERATION

INTRODUCTION

Detailed operation procedures which depict all user phases of the printer operation are included in publication GEK-49264, TermiNet 310/320/330 /340 Line Printer Operator's Manual. These user instructions will not be duplicated in this service manual. However, certain control and control function information is included to help familiarize the service technician with the operation and function of the front panel switches.

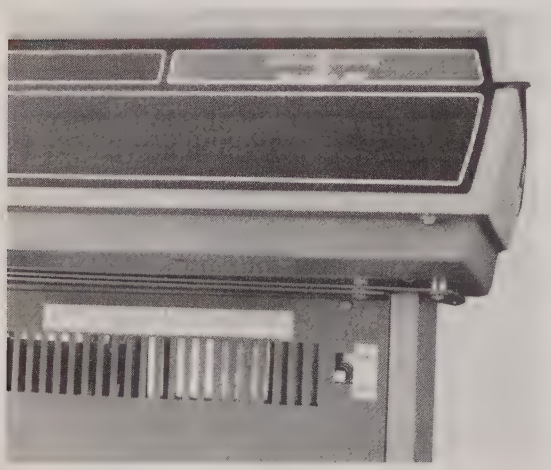
CAUTION

Do not operate printer without ink ribbon cartridge installed, as excessive print finger wear may result.

Failure to observe this caution will void printer warranty.

SWITCHES AND INDICATORS

Operating power is supplied to the printer through a pedestal-mounted switch. The location of this switch is shown in Figure 3-1.



PLH-8041

Figure 3-1. Power On Switch

Depending upon which interface circuit board is being employed in the printer, the function of the control panel switches and indicators differ. The following Figures 3-3, 3-4, and 3-5 illustrate the various control panels and their functions.

The printer is equipped with an audible alarm (a pedestal-mounted bell) which will be sounded whenever the BEL lead is activated by the data source. The bell may be used for whatever purpose is dictated by the system.

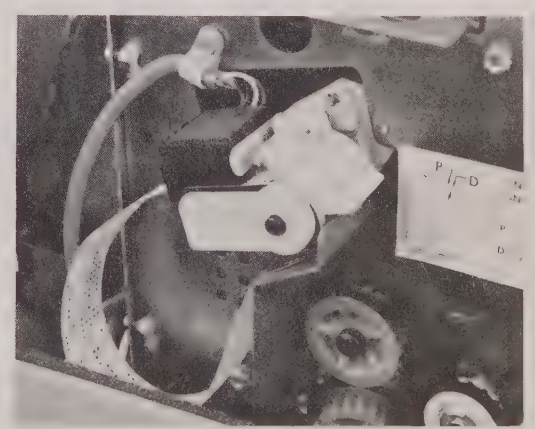
SLEW STROBE ASSEMBLY

The slew strobe assembly is standard on all TermiNet 310/320/330/340 Line Printers. This assembly consists of a strobe disc attached to the right side of the line feed clutch, and a photo detector bracket-mounted to the left side frame. The photo detector contains a small printed wire board, called the VTFC board, with an attached cable and plug for connection to the main VT-FF cable from the bustle. The slew strobe assembly provides paper slewing capability on all of these Printers without the necessity for having the optional VFU. The VFU is used only for vertical formatting paper forms with a pre-programmed tape loop. Paper slewing in either case is accomplished the same way—that is, by transmittal of paper slew commands to the printer from the data source.

VERTICAL FORMAT UNIT OPTION

DESCRIPTION

The paper tape VFU (Figure 3-2) is used to feed printer paper rapidly to a predetermined line position upon recognition of a remotely generated form feed (FF) or vertical tabulation (VT) code.



PLH 5017

Figure 3-2. VFU Option

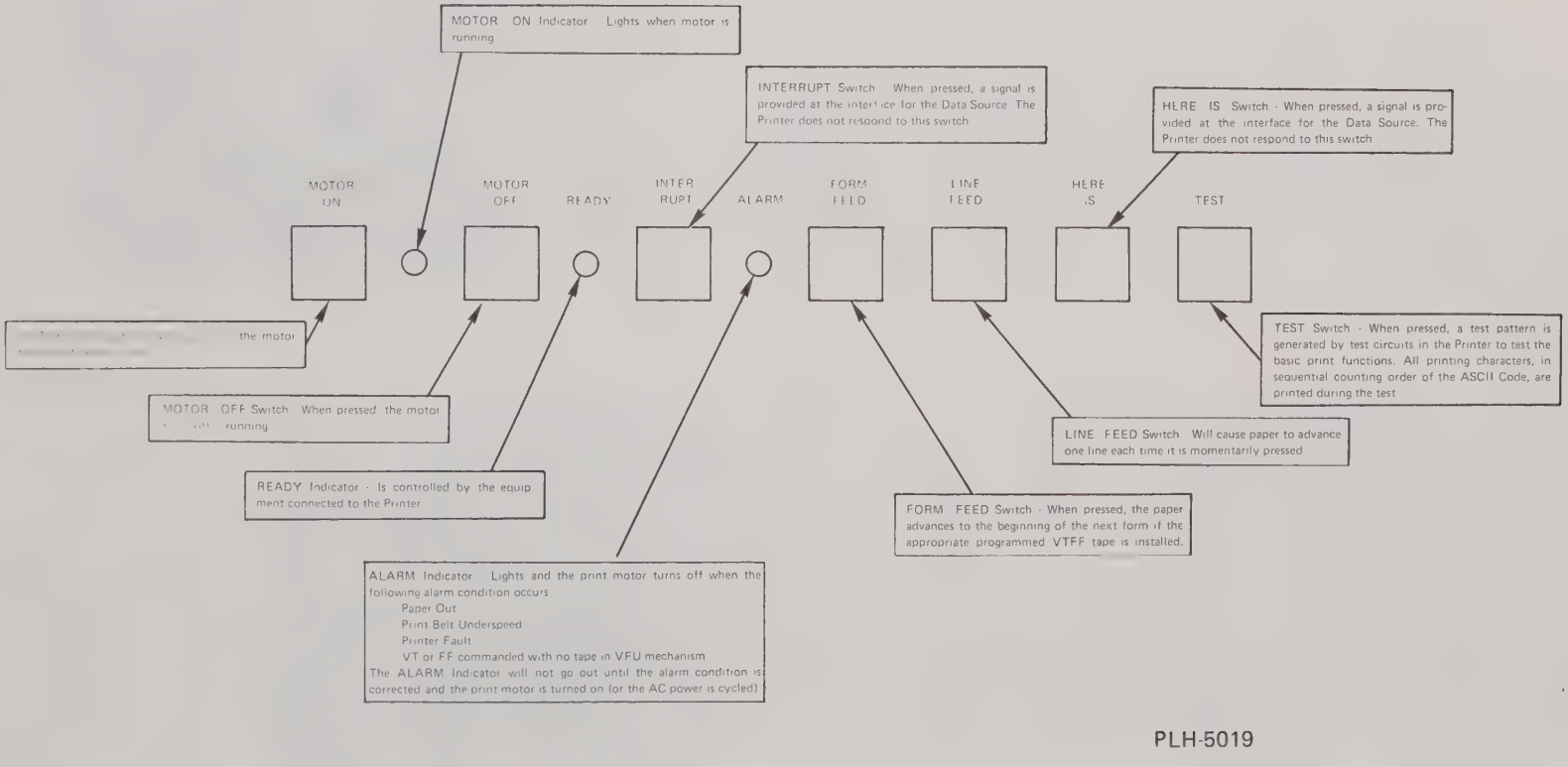

MOTOR ON Indicator Lights when motor is running
INTERRUPT Switch When pressed, a signal is provided at the interface for the Data Source The Printer does not respond to this switch
HERE IS Switch - When pressed, a signal is provided at the interface for the Data Source. The Printer does not respond to this switch
MOTOR ON
MOTOR OFF
READY
INTER RUPT
ALARM
FORM FEED
LINE FEED
HERE IS
TEST
the motor
MOTOR OFF Switch When pressed the motor running
READY Indicator - Is controlled by the equipment connected to the Printer
ALARM Indicator Lights and the print motor turns off when the following alarm condition occurs
Paper Out
Print Belt Underspeed
Printer Fault
VT or FF commanded with no tape in VFU mechanism
The ALARM Indicator will not go out until the alarm condition is corrected and the print motor is turned on (or the AC power is cycled)
FORM FEED Switch - When pressed, the paper advances to the beginning of the next form if the appropriate programmed VTFF tape is installed.
LINE FEED Switch Will cause paper to advance one line each time it is momentarily pressed
TEST Switch - When pressed, a test pattern is generated by test circuits in the Printer to test the basic print functions. All printing characters, in sequential counting order of the ASCII Code, are printed during the test
PLH-5019

Figure 3-3. Standard TermiNet Line Printer Control Panel Functions

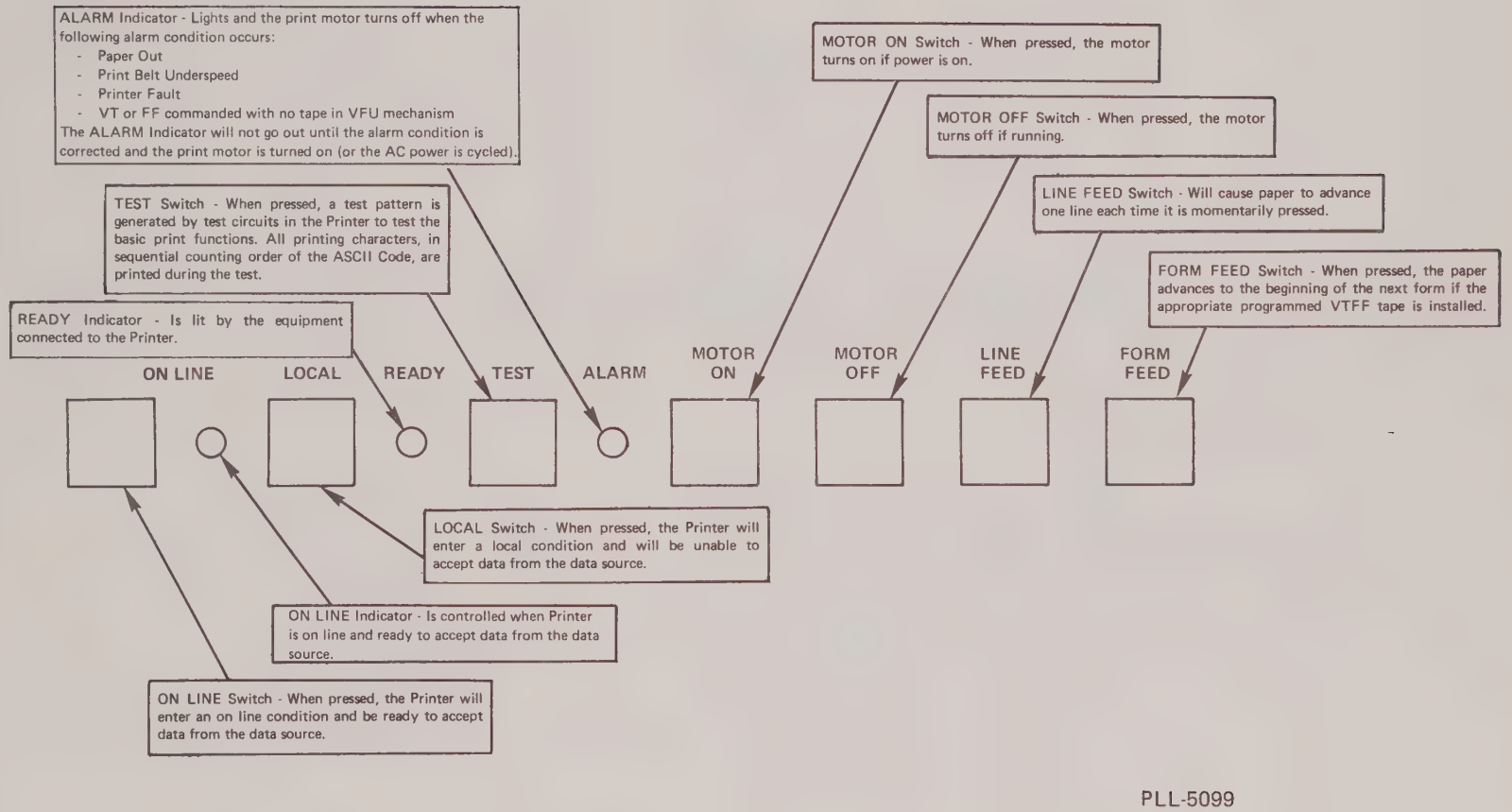

ALARM Indicator - Lights and the print motor turns off when the following alarm condition occurs:
- Paper Out
- Print Belt Underspeed
- Printer Fault
- VT or FF commanded with no tape in VFU mechanism
The ALARM Indicator will not go out until the alarm condition is corrected and the print motor is turned on (or the AC power is cycled).
TEST Switch - When pressed, a test pattern is generated by test circuits in the Printer to test the basic print functions. All printing characters, in sequential counting order of the ASCII Code, are printed during the test.
READY Indicator - Is lit by the equipment connected to the Printer.
MOTOR ON Switch - When pressed, the motor turns on if power is on.
MOTOR OFF Switch - When pressed, the motor turns off if running.
LINE FEED Switch - Will cause paper to advance one line each time it is momentarily pressed.
FORM FEED Switch - When pressed, the paper advances to the beginning of the next form if the appropriate programmed VTFF tape is installed.
ON LINE
LOCAL
READY
TEST
ALARM
MOTOR ON
MOTOR OFF
LINE FEED
FORM FEED
LOCAL Switch - When pressed, the Printer will enter a local condition and will be unable to accept data from the data source.
ON LINE Indicator - Is controlled when Printer is on line and ready to accept data from the data source.
ON LINE Switch - When pressed, the Printer will enter an on line condition and be ready to accept data from the data source.
PLL-5099

Figure 3-4. Buffered Parallel Interface TermiNet Line Printer Control Panel Functions

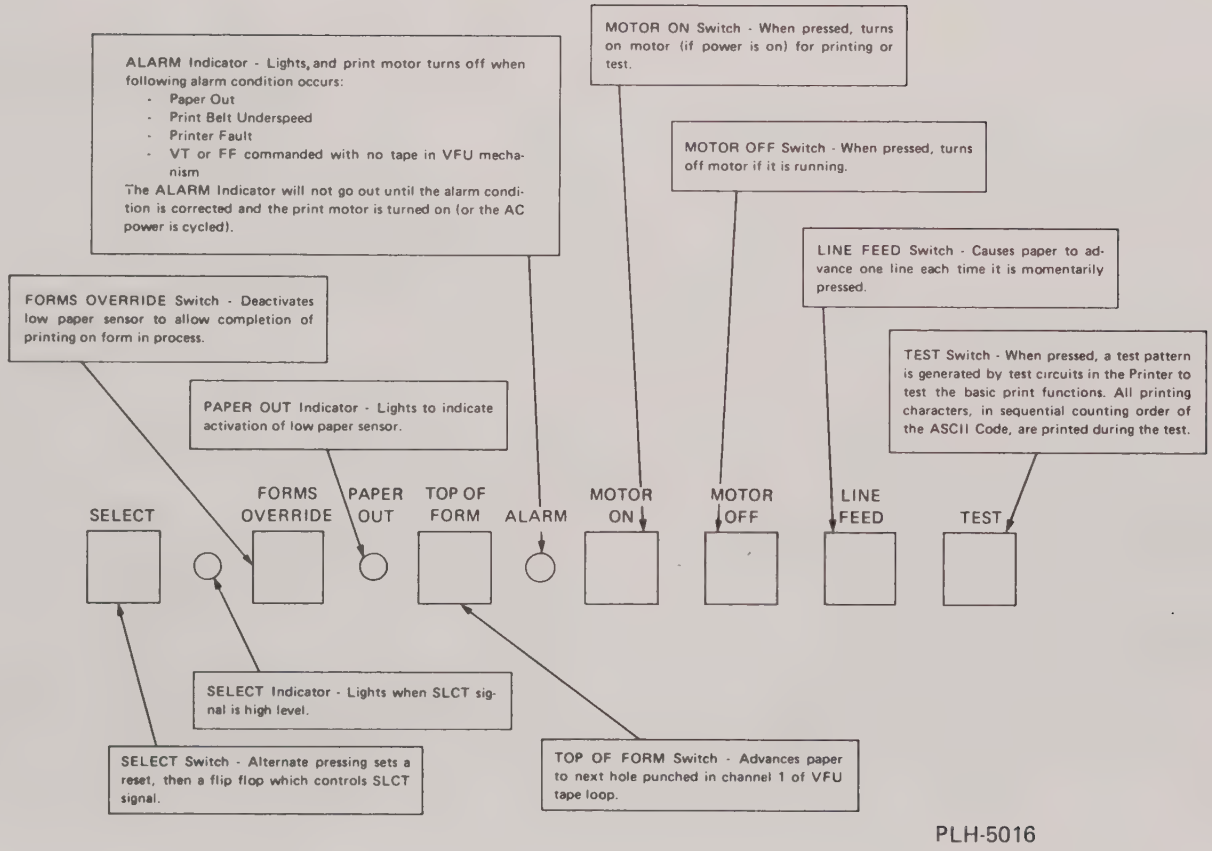

ALARM Indicator - Lights, and print motor turns off when following alarm condition occurs:
- Paper Out
- Print Belt Underspeed
- Printer Fault
- VT or FF commanded with no tape in VFU mechanism
The ALARM Indicator will not go out until the alarm condition is corrected and the print motor is turned on (or the AC power is cycled).
MOTOR ON Switch - When pressed, turns on motor (if power is on) for printing or test.
MOTOR OFF Switch - When pressed, turns off motor if it is running.
LINE FEED Switch - Causes paper to advance one line each time it is momentarily pressed.
TEST Switch - When pressed, a test pattern is generated by test circuits in the Printer to test the basic print functions. All printing characters, in sequential counting order of the ASCII Code, are printed during the test.
FORMS OVERRIDE Switch - Deactivates low paper sensor to allow completion of printing on form in process.
PAPER OUT Indicator - Lights to indicate activation of low paper sensor.
SELECT
FORMS OVERRIDE
PAPER OUT
TOP OF FORM
ALARM
MOTOR ON
MOTOR OFF
LINE FEED
TEST
SELECT Indicator - Lights when SLCT signal is high level.
SELECT Switch - Alternate pressing sets a reset, then a flip flop which controls SLCT signal.
TOP OF FORM Switch - Advances paper to next hole punched in channel 1 of VFU tape loop.
PLH-5016

Figure 3-5. Unbuffered Parallel Interface TermiNet Line Printer Control Panel Functions

The paper tape VFU uses a standard one-inch-wide eight-channel paper tape with 1/10-inch pitch sprocket holes located between channels 3 and 4 (see Figure 3-6). The sprocket holes serve as the strobe control for operating the VFU assembly and has a tape-in/tape-out function designed so the printer will not respond to the VT/FF codes when the paper tape is missing. Channel 1 is used for form feed and channel 6 is used for vertical tab. No other channels are recognized by the tape reader.

Whenever a form feed (FF) command is recognized by the VFU, the programmed paper tape will rapidly advance, causing the paper in the printer to feed out at the same rate until the VFU tape reader senses a hole in channel 1 of the tape. At this point the paper will stop feeding along with the paper tape. Any vertical tabs set (holes in channel 6) will be skipped over, as the VFU reader is looking only at channel 1.

A recognized vertical tab command will cause the VFU to operate in the same manner as described above except that the VFU tape reader will look for channel 6 holes only while the tape is advancing through the reader. The first hole sensed in channel 6 by the VFU tape reader will cause the tape to stop moving and the paper in the printer will stop feeding at the same time.

NOTE

If a VT code is initiated and there is no corresponding hole in the tape, the printer will continue to advance paper to the start of the next form.

PREPARING THE VFU PAPER TAPE

A standard one-inch (2.54 cm) tape 6 to 12 inches (15.2 to 30.4 cm) long is programmed by punching a hole in channel 1 to correspond with the first line on the form to be used. Holes are punched in channel 6 to correspond with selected lines on the form where vertical tabs are desired.

CALCULATING THE NUMBER OF LINE SPACES PER FORM

To determine the number of line spaces in the form to be used, simply measure the length of the form in inches and multiply by 6. If the form is measured in centimeters, multiply by 2.36 and round off to the nearest whole number.

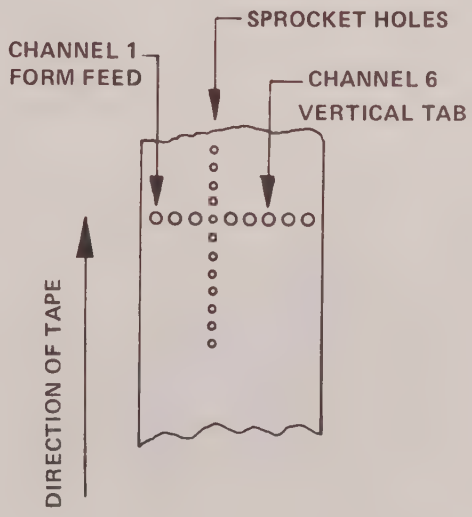
NOTE

For printers equipped with the 6 or 8 Lines per Inch (LPI) option, and 8 LPI is selected, multiply the number of measured inches in the form by 8. If the form is measured in centimeters, multiply by 3.15 and round off to the nearest whole number.

CALCULATING THE VFU PAPER TAPE LENGTH

Once the form size and corresponding number of spaces are determined from the above step, the length of tape (in inches) needed for the VFU format can be determined simply by multiplying the number of lines in the form by 1/10. To find the length of tape needed for the VFU format in centimeters, multiply the number of lines in the form by 0.254.

Since the tape length to be used in the VFU mechanism cannot be less than 6 inches (15.24 cm), the VFU format corresponding to forms less than 10 inches (25.4 cm) in length will have to be repeated on the prepared tape as many times as necessary to make the total tape length at least 6 inches (15.24 cm). No tape should exceed 12 inches (30.48 cm) in length.



OVT-4004

Figure 3-6 Paper Tape for Use with VFU

Example No. 1

Calculate the length of tape needed for use with 11-inch forms.

STEP 1 — 11 inches × 6 = 66 lines/form

STEP 2 — 66 lines/form × 1/10 = 6.6 inches

It is determined from the above calculation that 6.6 inches of tape are required for the VFU format. Since this is over the 6-inch minimum tape length requirement, the format would appear only once on the prepared tape.

Example No. 2

Calculate the length of tape needed for use with 4 1/2-inch forms.

STEP 1 — 4-1/2 inches × 6 = 27 lines/form

STEP 2 — 27 lines/form × 1/10 = 2.7 inches

Since the length of tape needed for the format is only 2.7 inches, the format will have to be repeated as many times as necessary to meet the 6-inch minimum total tape length requirement. If the format was repeated once, the total length would be 5.4 inches which is short of the 6-inch requirement. If the format was repeated twice, the total tape length would be 8.1 inches which satisfies the 6-inch minimum requirement. It is obvious then that the prepared tape for use with 4 1/2-inch forms would have to contain the VFU format 3 times and would be 8.1 inches in total length.

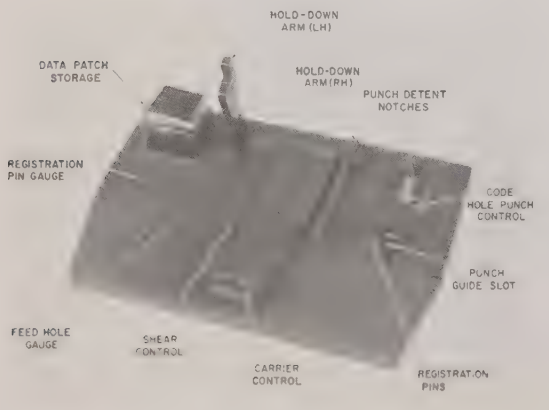


Figure 3-7. Manual Punch and Splicer

PROGRAMMING THE VFU TAPE

When the VFU tape length has been determined, the tape can then be punched using a manual punch or any other device capable of generating standard eight channel paper tape. When using the latter method, remember that the VFU tape reader monitors only at channels 1 and 6. Therefore, any ASCII code character containing a "1" bit in channel 1 can be used to program a form feed hole in the tape. Likewise, any ASCII code character with a "1" bit in channel 6 can be used to program a vertical tab hole in the tape.

NOTE

A programmed form feed will not be affected if channel 6 is also punched along with channel 1. However, channel 1 cannot be punched along with channel 6 for programmed vertical tabs.

Manual Punch and Splicer

A manual punch and splicer tool (part number 44A418630-003) is available which facilitates the making of VFU tapes. Figure 3-7 illustrates this tool.

To use the manual punch and splicer tool refer to the following procedure:

1. Obtain a 14-inch (35.6 cm) length of paper or mylar tape with prepunched sprocket holes.

2. Mark the tape length for a particular form length, determined from the previously given calculations.

3. With the manual punch and splicer on a flat surface, proceed to program the VFU tape as follows:

   a. Lift the carrier control to the open position.

   b. Orient channel 1 toward the back of the punch and splicer.

   c. Engage a feed hole on the registration pin gauge.

   d. Pull the tape gently toward the right and hold against the ledge. Observe six

white registration dots (progressively from left to right) through the tape sprocket feed holes. Note that no more than one-half of any registration dot should be covered by the tape adjacent to any registration hole, horizontally or vertically.

e. Place the left and right hold-down arms over the tape and move the required code hole punch control to the required channel.

f. Depress the code hole punch control to perforate the required code hole.

g. Repeat steps (e) and (f) until the required codes are established.

4. Engage the tape on the registration pins so that the last code hole of the tape is either to the right or left of the cutting line.

5. Shear the tape using the carrier control and shear control.

6. Repeat steps 4 and 5 at the opposite end of the tape with the first code hole on the opposite side of the cutting line.

7. Butt-splice the tape using a patch provided in the data patch storage container. If a code hole is covered by the patch, repeat step 3 (f).

8. Open the hold-down arms and remove the punched tape.

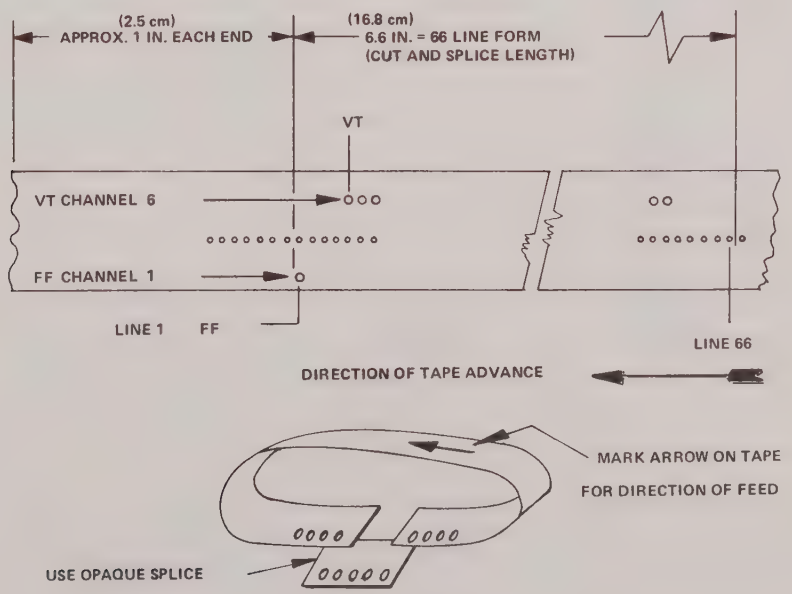
9. Smooth the patch and reinspect the punched tape for correct punches and junction.

Figure 3-8 illustrates a punched VFU tape prepared on a manual punch and splicer for 11-inch (27.94 cm) forms having 66 lines. Vertical tabs are shown punched in lines 5, 6, 7, 60, and 61. Figure 3-8 also shows the joining technique.

After the VFU paper tape has been programmed and the ends of the tape have been joined together with an opaque splice so as to form a loop, the tape should be marked with an arrow to indicate the direction of feed.

Tape and Splicing Material

Improved ease of adjustment and operation of the VFU results when tape and splices are used that are made of material which does not allow the passage of light.



OVT-4007

Figure 3-8. Example of 66-Line, 11-inch (27.9 cm) Form Preparation Using a Punch and Splicer

If a translucent tape is used, the passage of light through the tape can cause activation of the Vertical Tab, Form Feed, and Sprocket Detectors prior to the holes in the tape coming directly between the emitters and detectors.

If a transparent or translucent splicing patch is used, and the ends of the tape separate slightly, light can be transmitted through the separation and patch, and be detected as a code hole.

It is therefore recommended that only opaque (greater than 99%) tape and splicing patches be used. Black oiled paper tape or opaque Mylar is recommended. Opaque black Mylar splicing patches are recommended.

Tape, splicing patches, and a punch/splicer may be ordered from General Electric Company, DCPBD, Waynesboro, Virginia 22980.

Part Number	Description
44A418630-001	12 each Pressure Sensitive Opaque Splicing Patches (Vendor Type POS-8)
44A418630-002	5 ft. Oiled Paper Tape with Sprocket Holes (>99% Opaque)
44A418633-003	1 each Punch/Splicer, Vendor Type GW-303-01 12 each Pressure Sensitive Opaque Splicing Patches (Vendor Type POS-8) 5 ft. Oiled Paper Tape with Sprocket Holes (>99% Opaque)
44A418633-004	1 each Punch/Splicer, Vendor Type GW-303-01

The following kit is available from General Electric Company.

44B500744-G01	12 each Pressure Sensitive Opaque Splicing Patches 5 ft. Oiled Paper Tape with Sprocket Holes (>99% Opaque)

OPERATING THE VFU

1. Lift the printer top cover to permit access to the VFU mechanism.
2. Lift the tape hold-down cover and install the programmed tape over the sprocket ensuring that the sprocket teeth engage the paper tape sprocket holes.
3. Close the tape hold-down cover.
4. Close the printer top cover.
5. Turn the Printer on and press the Form Feed pushbutton. This will advance the paper tape to the next form feed position.
6. Adjust the form on the printer according to the user's requirement.

OPERATIONAL PROBLEMS

Should the VFU fail to operate properly, consult Chapter 5, PARTS REPLACEMENT AND ADJUSTMENTS, for adjustment procedures.

OPTIONAL PAPER FEEDING COMMANDS

The optional paper control character in each line of data transferred from the data source to the printer is reserved for paper action. The location of this character in the data line depends on the type of interface used. The Printer internal logic will respond as follows to this character:

DATA BITS							ACTION	EQUIVALENT ASCII CHARACTER
7	6	5	4	3	2	1		
1	SLEW DATA						VERTICAL SLEW	(SEE TABLE 3-1)
0	1	0	0	0	0	0	VERTICAL TAB	SP
0	0	1	0	0	0	0	FORM FEED	DLE
0	0	0	1	0	0	0	LINE FEED	BS
0	1	0	1	0	0	0	VT & LF	(
0	0	1	1	0	0	0	FF & LF	CAN
1	0	0	0	0	0	0	CARRIAGE RET.	@

VERTICAL SLEW

Whenever bit 7 in the paper feeding command is a "1", paper will be slewed by the number of lines dictated by the lower 6 bits of the character. Table 3-1 lists the vertical slewing increments that the Printer will provide, and the corresponding bit patterns required. The equivalent ASCII character for each bit pattern is also listed for reference.

TABLE 3-1
VERTICAL SLEWING COMMANDS

LINES OF SLEWING	BIT PATTERN REQUIRED	EQUIVALENT ASCII CHAR.	LINES OF SLEWING	BIT PATTERN REQUIRED	EQUIVALENT ASCII CHAR.
1	1000001	A	33	1100001	a
2	1000010	B	34	1100010	b
3	1000011	C	35	1100011	c
4	1000100	D	36	1100100	d
5	1000101	E	37	1100101	e
6	1000110	F	38	1100110	f
7	1000111	G	39	1100111	g
8	1001000	H	40	1101000	h
9	1001001	I	41	1101001	i
10	1001010	J	42	1101010	j
11	1001011	K	43	1101011	k
12	1001100	L	44	1101100	l
13	1001101	M	45	1101101	m
14	1001110	N	46	1101110	n
15	1001111	O	47	1101111	o
16	1010000	P	48	1110000	p
17	1010001	Q	49	1110001	q
18	1010010	R	50	1110010	r
19	1010011	S	51	1110011	s
20	1010100	T	52	1110100	t
21	1010101	U	53	1110101	u
22	1010110	V	54	1110110	v
23	1010111	W	55	1110111	w
24	1011000	X	56	1111000	x
25	1011001	Y	57	1111001	y
26	1011010	Z	58	1111010	z
27	1011011	[	59	1111011	{
28	1011100	/	60	1111100	¦
29	1011101	]	61	1111101	}
30	1011110	^	62	1111110	~
31	1011111	_	63	1111111	DEL
32	1100000	\			

6 OR 8 LINES PER INCH OPTION

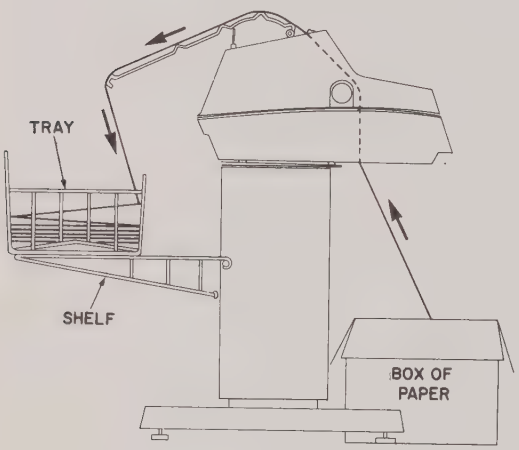
The 6 or 8 Lines per Inch option allows the operator to select either one of the two vertical line spacings – 6 or 8 LPI. This option may be field installed on printers with serial number 02920 or higher. A kit (part number 44A410687-G15) that contains all of the necessary parts and instructions for installing this option is available.

OPERATION

When operating a printer including this option, a recommended procedure is to execute one or two linefeeds every time after manually advancing paper with the platen knob. This will insure that all play in the gear train is taken up thus eliminating uneven line spacing between the first two lines of text.

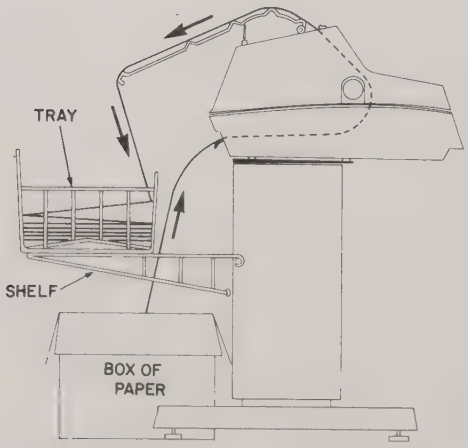
PAPER SHELF, TRAY, AND TRAY EXTENDERS (OPTIONAL)

The optional wire frame paper shelf and separate optional tray can be used with any model in the TermiNet 340 Family of Line Printers. The purpose of these options is to collect and neatly stack forms exiting from the rear of the printer. Figures 3-9 and 3-10 illustrate both front and rear paper feeding paths using the optional paper shelf and tray.



PLH-6121

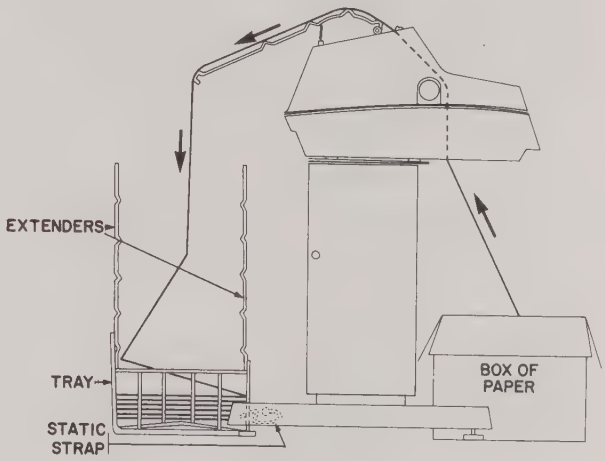
Figure 3-9. Front Paper Feeding Using Shelf and Tray



PLL-6122

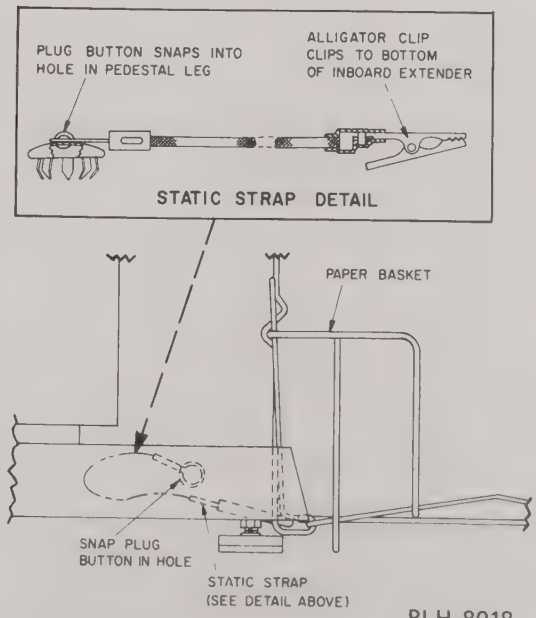
Figure 3-10. Rear Paper Feeding Using Shelf and Tray

As an additional option, extenders are available for use with the paper tray. This option can be used only when feeding forms from the front of the printer as illustrated in Figure 3-11. When this configuration is used, a static strap should be used to ground the tray through the pedestal. One end of the strap clips onto the tray with the other end snapping into a hole on the inside of the pedestal leg (see Figure 3-12).



(See Figure 3-12) PLH-6123

Figure 3-11. Front Paper Feeding Using Tray with Extenders


PLUG BUTTON SNAPS INTO HOLE IN PEDESTAL LEG
ALLIGATOR CLIP CLIPS TO BOTTOM OF INBOARD EXTENDER
STATIC STRAP DETAIL
PAPER BASKET
SNAP PLUG BUTTON IN HOLE
STATIC STRAP (SEE DETAIL ABOVE)

PLH-8018

Figure 3-12. Static Strap Connection

CHAPTER 4

PRINCIPLES OF OPERATION

SECTION 1

LINE PRINTER DESCRIPTION

FUNCTIONAL DESCRIPTION (Figure 4-1)

GENERAL

The TermiNet 340 Line Printer is capable of printing 340 lines of data per minute. The printer uses the standard 7 bit USASCII code. Each full line of incoming data from the data source is buffered and then printed during one font time (i.e., the length of time required for one complete font of print fingers to pass a given column). Data is transferred from the source to the buffer during paper movement so all available time is used for printing.

The printer control system can be made compatible with a variety of data processors and communications buffers. The printer interface is designed for operation in either a system in which the printer controls timing of data transfer or the data source (processor) controls all timing. The printer interfacing is compatible with TTL (transistor to transistor logic) employing the standard 7400 series of solid state devices. The "on" state is a logic 1 signal of greater than 3 volts positive.

NOTE

Although the following description is intended to cover only one particular type of interface, many of the operating characteristics between the different types are similar.

INTERFACE

When the printer is in the load condition (i.e., is ready to accept data), data is transferred in parallel bit fashion, character serial, from the data source through the Printer interface (INT Board) to the print memory located on the LOG board. When a full line of characters has been transmitted, a transfer signal from the interface causes the print sequence to begin. At this time, the interface signals the data source that the Printer is busy printing. A new line of data cannot be received until the old line is completely printed. After the data line has been printed, the interface signals the data source that the printer can again accept one line of data. The INT board then acts as a data flow regulator.

Another function of the INT board is to decode the first character (last character in certain systems) of each data line. This 7 bit non-USASCII code character is a paper feed code which initiates the LF, VT, or FF paper feed commands.

As each printable character is received at the INT board, it is checked for correct parity. If an error is detected in a character being processed, the INT board will cause a diamond to be printed in place of the character having the incorrect parity (strapping option).

Data is presented to the INT board from the data source over data lines D1 to D8. The data is strobed in by a 2 μs strobe pulse. The maximum instantaneous transfer rate is 60,000 cps. An ACK signal is sent to the data source by the INT board each time a character has been strobed into memory. This is for data sources using a closed loop by character system. Other systems may not employ the ACK signal.

The data source must be able to recognize the state of the interface signal RFP (Ready from Printer) which is used to signal the data source whether or not the printer can accept more data. After each line of data is sent to the printer, the data source should generate the signal TRAN (Transfer). If the data source does not have the capability to generate a TRAN signal, but just scans RFP as a go/no-go status, then the Printer can internally generate a substitute for TRAN. Signal RFP is also used to alert the data source as to several status conditions in the printer such as Alarm, Low Voltage, and Test.

Other interface signals used on the INT board are Answerback, Bell, Frame Ground, Interrupt, Low Paper, Motor Off, Motor On, Motor-Or-Feeding, Power On, and Signal Ground.

MOTOR CONTROL

When power is first applied, all circuits of the printer are initialized. At that time, the motor is off, the print memory is cleared, and the printer is in the load condition. When the MOTOR ON signal is received from the pushbutton on the control panel, or remotely from the data source, the motor timer signal MTD energizes the motor relay on the XPS board. MTD will remain on long enough to allow the print belt to attain full speed. The MOTOR ON signal also clears any prior alarm condition. Whenever an alarm condition exists in the printer due to a Fault, Paper Out, or Low Speed detection, the appropriate circuits on the LOG board will turn off the motor.

DATA TRANSFER*

When the printer is in the load condition, data is transferred bit parallel, character serial from the data source, through the interface, and into print memory on the LOG board. Character Data is received asynchronously at the Data Latches which are set by the Data Strobe. A synchronized Data Strobe then transfers each character from the latches to the print memory shifting the print memory and advancing the column counter. When the full line of characters has been transmitted, a transfer signal from the interface clears the load mode and the print sequence begins. A print complete signal sets the Load circuit to return the printer to the load condition when the data has been printed.

PRINTING

Printing is accomplished by energizing the desired print hammer solenoids at the appropriate belt position so that they strike the desired moving type finger. Basic timing for the print dynamics is provided by drive counters on the LOG board. The counters are initialized to the drive state by each finger timing signal from the PSR board and then advanced through succeeding states by the system clock. A Drive Signal turns on a High Voltage Switch (HVS board) which applies power to its respective Hammer Bank to energize those columns which have been pulled by Column SCR's on the LHD board. At the end of the drive period, a commutate signal from the LOG board causes the High Voltage Switch (HVS board) to supply a negative voltage to its hammer bank for commutation of the column SCR's on LHD. Finally, the drive counter on LOG advances to the compare state removing the commutate signal to allow the HVS to again go positive so that column SCR's may be fired in preparation for the next drive period. Since belt timing alternates between even and odd finger signals, all drive timing is symmetrically interlaced.

When the print condition exists, Print Memory is shifted and circulated at system clock rate and the Column Counter is advanced to keep in step. Belt position is derived from the belt timing signals and it is compared with the character code and the associated column number to produce the column SCR firing pulses. Each time a fire pulse is emitted, an erase signal is applied to the data multiplexer to remove the character from memory by preventing recirculation. The LOG board also contains circuits that prevent firing hammers when the motor is stopped, when paper is in motion, when the maximum fire counter is limiting, or when there is no compare signal from either of the drive counters. During the inhibit fire condition, printing is suspended but no data is removed from memory. The belt printing logic contains circuits to detect an empty memory and generate a print complete signal.

PROTECTION

To protect the printer against energizing too many hammer solenoids at one belt position, a Maximum Fire Counter receives all SCR fire pulses. If it counts an excessive number of pulses, it produces a fire limit signal to suspend firing for the remainder of that finger period. This counter is restored by the belt timing signals at the beginning of each finger period. Suspension of firing causes no data loss but it delays the printing of the suspended characters for one full font period.

To prevent printing characters at an average rate that cannot be sustained by the Printer, a Rate Control Counter on the LOG board produces a Rate Limit signal to delay the Print Complete indication and suspend transfer of more data.

PAPER ACTION CONTROL

Platen motion is controlled by the line feed clutch which is operated by the line feed solenoid. The line feed solenoid is energized by the LOG board in the execution of any of the four paper actions; line feed, form feed, vertical tab, and vertical slew. All actions

*May vary with type of Interface used.

may be initiated by the remote data source. Line Feed and Form Feed pushbuttons are on the front panel for manual control.

Paper action is also controlled by a vertical tab and form feed mechanism which uses a punched paper tape loop. Photoelectric sensing of its sprocket holes and vertical tab and form feed stop holes provides signals to the system control logic on the LOG board.

A line feed signal triggers the Line Feed Timer which provides a line feed solenoid pulse. A form feed signal sets the Form Feed Flip-Flop which holds until the form stop signal from the form feed photoelectric circuit clears it. A vertical tab signal sets the Vertical Tab flip-flop which holds until either the vertical tab stop or the form feed stop clears it.

Vertical slew is started by setting the Slew Counter to the contents of the Data Latches when a slew strobe is received from the interface. This counter provides paper slewing until it has been counted back to zero by sprocket pulses from the form feed photocircuit.

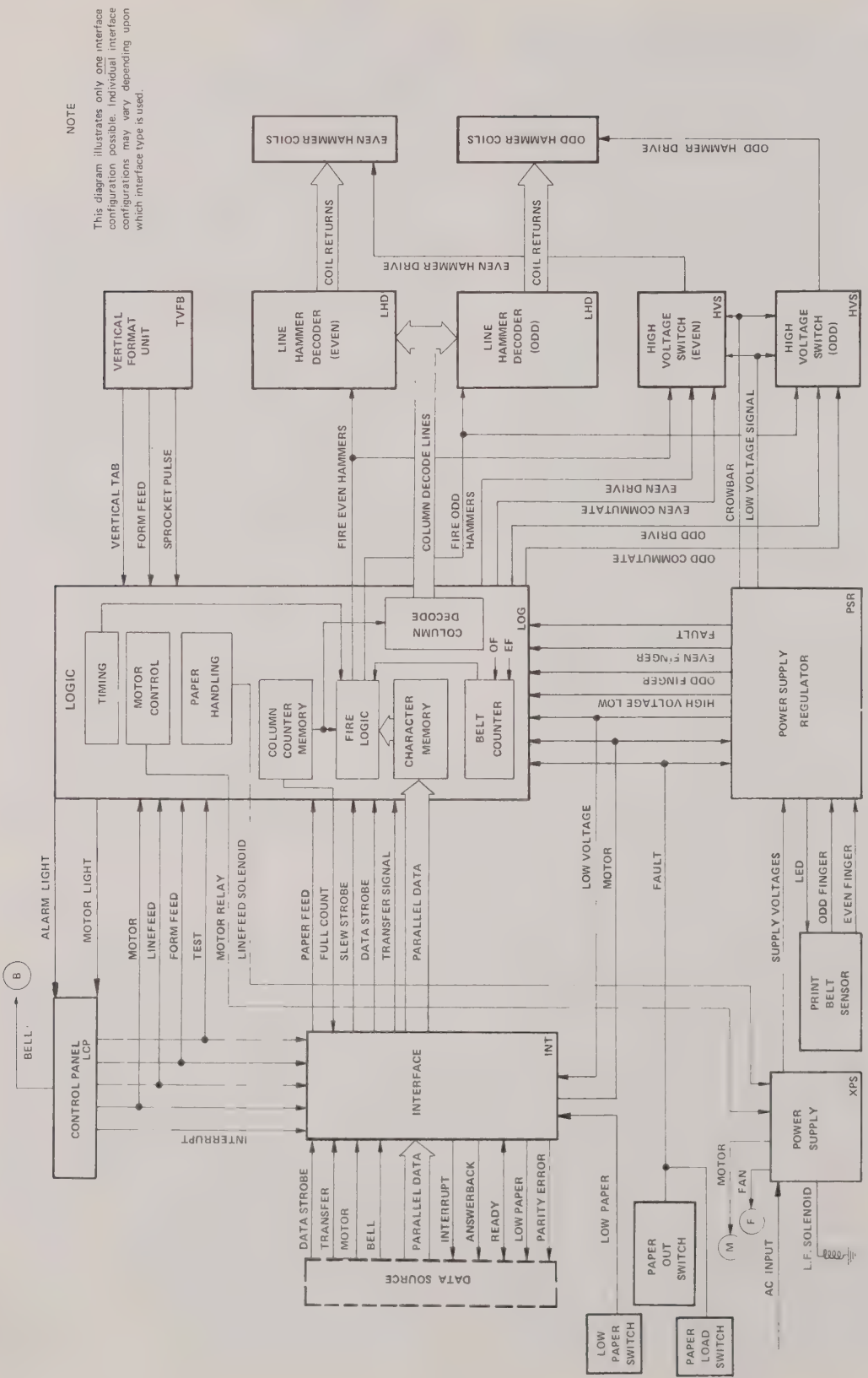
A Line Feed Solenoid Timer is used to control the line feed solenoid driver. If a paper action is too long the LFS timer will time out and cause an alarm condition. The trailing edge of LFS triggers the Line Feed Delay Timer which provides the necessary delay for the platen to come to rest after the line feed solenoid is dropped. A feeding signal is provided to suspend printing during paper action.

SELF TEST FEATURE

The LOG board also provides circuits for the self test feature on the printer. From the TEST pushbutton on the front panel, a test signal is applied to the Test Generator which produces characters in ascending order of the ASCII code during a test load sequence. When a line of data has been generated, a stop test generation signal from the Column Counter halts the generator counter at the proper position and stops the load sequence. When printing of the line is complete, the print complete signal triggers the line feed timer. Also the test generator resumes its generation of data starting one character code lower than it did for the previous line. Thus, a staggered test pattern is printed.

NOTE

Some special models contain the TEST switch in the interface board.



PLH 6114

Figure 4-1. TermiNet 340 Line Printer Functional Block Diagram

SECTION 2

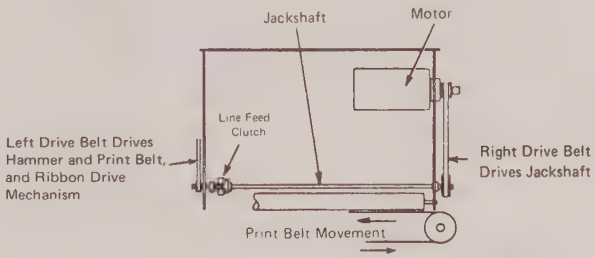
MECHANICAL OPERATION

MAIN DRIVE

The drive power (see Figure 4-2) for the printer is provided by a motor located under the XPS board at the right side of the printer. The power from the motor is transmitted by means of the right drive belt to the right drive pulley on the jackshaft. The jackshaft transmits the power to two separate areas, the first being the line feed clutch used for advancing the paper. The second output from the jackshaft goes to the left drive pulley which transmits power to the left print belt pulley shaft by means of the left drive belt. The left print belt pulley shaft drives the print belt, and also drives the ribbon drive through a gearing arrangement on the bottom of the left pulley support casting. Any time the motor is running, the print belt will rotate counter-clockwise, and the ribbon will move continuously from right to left.

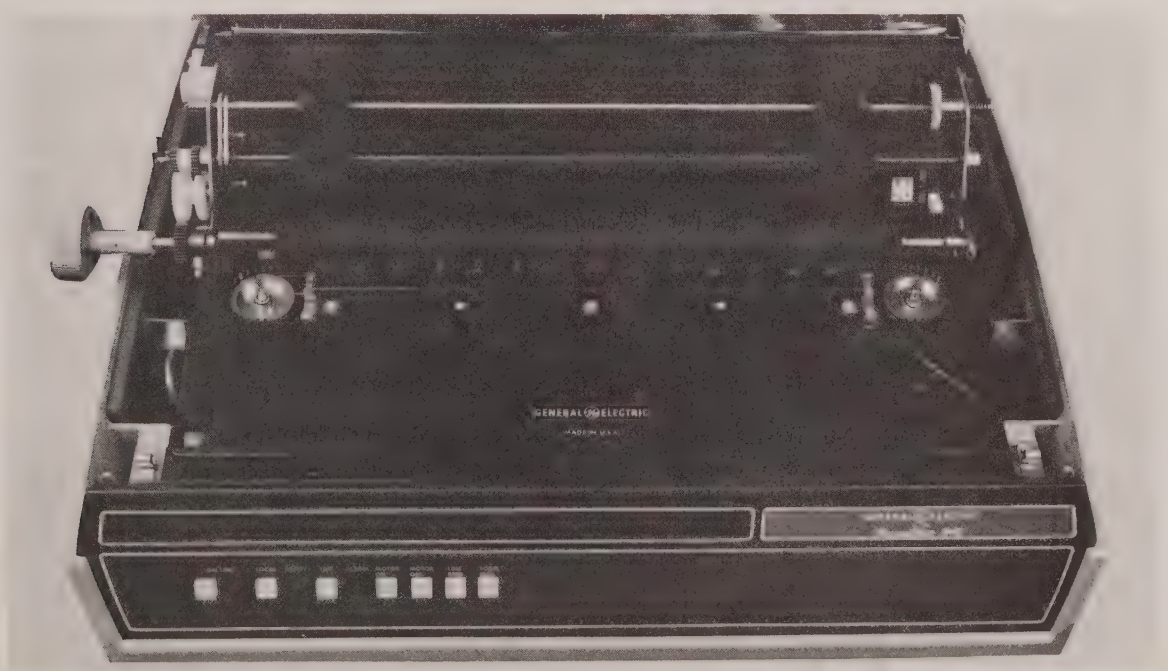
RIBBON DRIVE

The ribbon drive mechanism is driven from the left print belt pulley shaft through a series of reduction gears. A clutch is employed on one end of the ribbon drive shaft to insure only counter-clockwise movement of the shaft. A drive coupling on the other end of the drive shaft engages a hub in the ribbon cartridge which is specially designed to break in the event that the ink ribbon would hang up or jam for any reason. This design feature protects the ribbon drive mechanism from possible damage should a ribbon jam or other similar malfunction occur. The ink ribbon is in the form of a long Mobius loop housed in a plastic cartridge which snaps in place over the hammer and print belt assembly (see Figure 4-3).


Jackshaft
Motor
Line Feed Clutch
Left Drive Belt Drives Hammer and Print Belt, and Ribbon Drive Mechanism
Right Drive Belt Drives Jackshaft
Print Belt Movement

PLH-6113

Figure 4-2. Drive Mechanism



PLH-8042

Figure 4-3. TermiNet 340 Printer Showing Ink Ribbon Cartridge Installed

Through the coupling arrangement, the ribbon is driven continuously whenever the motor is running so that it will pass from right to left behind the type fingers. Every ink ribbon cartridge contains a manual ribbon drive knob which can be rotated manually to drive the ribbon inside the cartridge. This feature permits operators to remove any ribbon slack by making the ink ribbon taut which allows for easier cartridge installation.

HAMMER AND PRINT BELT ASSEMBLY

The TermiNet 340 Line Printer (see Figure 4-4) uses a flexible belt to carry the type fingers used for printing. The fingers are mounted in vertical slots in the belt. Each finger has a type character or symbol embossed on the upper end. A two font belt holds two sets of 96 characters. A three font belt holds three sets of 64 characters. The fingers can be replaced by lifting them vertically out of the finger slot in the belt. Note that two or three of the fingers (font fingers) are special index fingers and cannot be removed from the belt. These fingers are wider at the bottom and serve as a reference point to trigger an electronic counting circuit used in the hammer and print finger actuation.

The print belt is driven by an AC motor and belt-drive system. The print belt travels counter-clockwise (as viewed from the top) at a constant rate in front of the paper and platen. An inking ribbon passes between the type fingers and the paper. Printing takes place when a typefinger is driven by a hammer against the ribbon and paper.

The position of each character in the belt is relative to the special wide index finger which is detected by the photoelectric light beam. This wide index finger triggers an electronic counting circuit which counts the finger movement of the belt. As the fingers in the belt move past each possible print column position, the column position is compared with the stored input data to determine when the finger is in the correct position. When this comparison indicates that the selected character is in the correct column position, the appropriate hammer is fired. There is a hammer in each print position (column), for a total of 132.

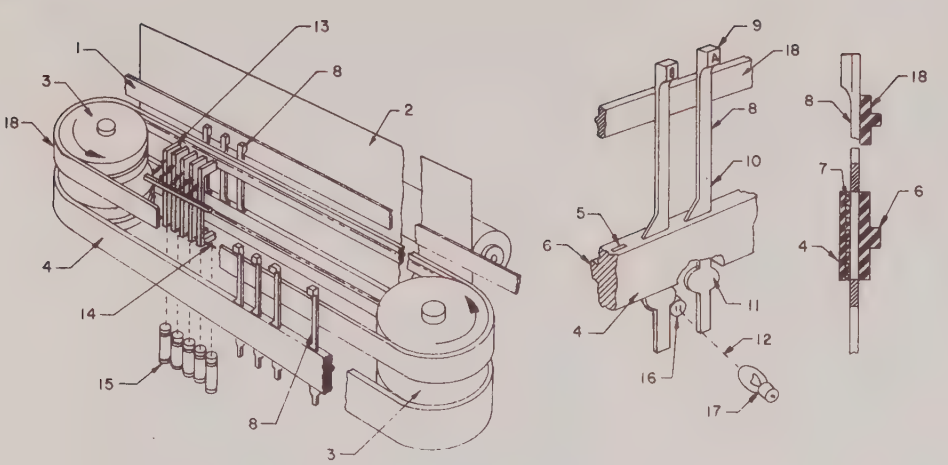
All of the individual hammers (see Figure 4-5) are mounted on a common pivot rod. Each hammer is connected by its clevis to a solenoid plunger. The clevis engages a curved slot at the base of the hammer. The other end of the clevis is linked to the solenoid plunger. When the solenoid coil is energized by the hammer drive circuit, the clevis is pulled down by the plunger, causing the hammer to pivot forward about the pivot rod. The face of the hammer travels forward approximately 0.077 inch (2.0 mm) while being pulled by the clevis. The curved slot at the base of the hammer serves a dual purpose. It provides an easy means for disconnecting the clevis and allows a means of overtravel (free-flight) for the hammer.

The actuation of a hammer against a print finger is electronically controlled by a timing process which uses an electronic buffer storage and counting system. When a character printout is selected by input data, the printer buffers or stores the input data and permits multiple hammer firing when selected fingers are in the correct position.

The solenoids are mounted and spaced uniformly in banks on the coil bar assemblies. There are four coil bar assemblies mounted parallel to each other with an angular displacement. Each coil bar assembly consists of a top and bottom piece and two side pieces. The bars are supported at the ends by the belt pulley castings.

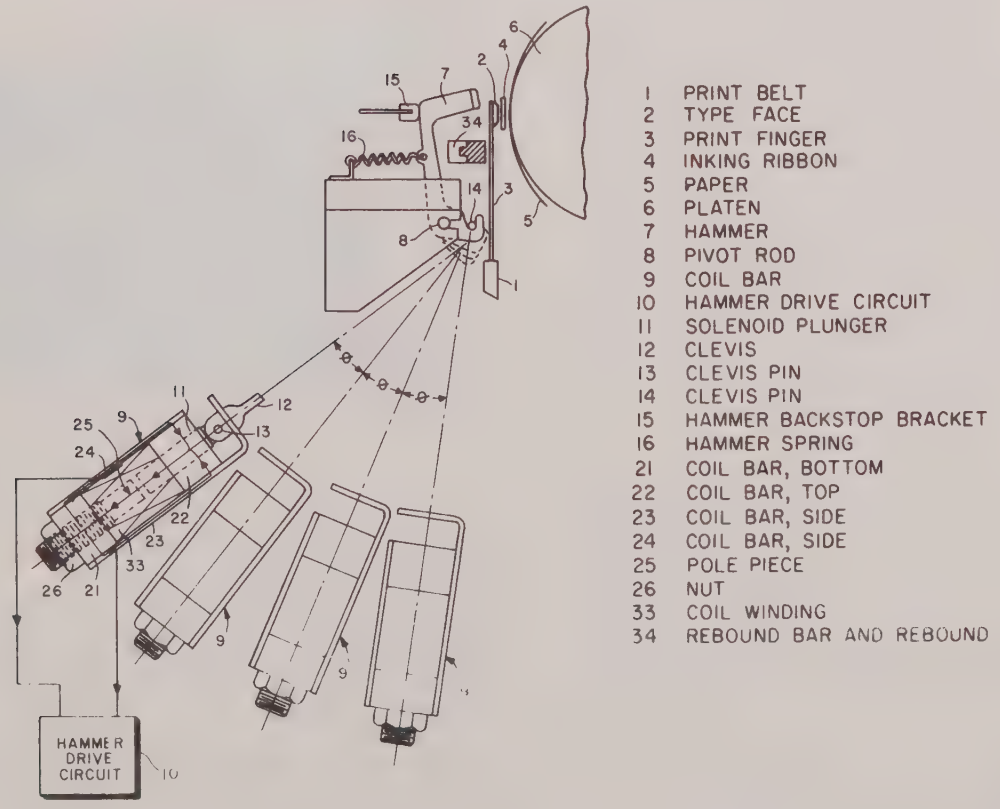
The solenoid plunger enters a hole in the top member of the coil bar. The bottom portion of the coil bar has a threaded hole to receive a threaded solenoid pole piece. The penetration of the pole piece in the coil bar is adjustable, and its position or depth is secured by a locking nut. This allows a travel adjustment of the upper plunger. The timing process of actuating a hammer is effected by the photocell position. The time from coil energization to hammer strike is approximately 1.3 milliseconds. When the hammer is at rest, it is held against the hammer backstop bracket by the hammer spring.

A narrow belt which rotates about a second set of pulleys directly on top of the print belt pulleys, serves as a traveling rebound belt for the print fingers (see Figure 4-4). The traveling rebound belt along with the rebound bar acts as a stop for a finger after a character has been printed. This prevents the fingers from oscillating and snagging on the hammers.



PTM-6156

Figure 4-4. Hammer and Print Belt Assembly



PTM-6157

Figure 4-5. Hammer Actuation Mechanics

PAPER HANDLING

GENERAL

Fan-fold type paper, punched along the edges for pin feeding is supplied to the TermiNet 340 Line Printer through either a front or rear paper entrance.

CAUTION

Multiple part forms must always be supplied from the front paper entrance.

The paper is moved through the printer by means of a paper handler which consists of a right and left paper tractor, a tie rod, and a drive shaft.

A paper out switch located at the rear of the hammerbank and beneath the left end of the platen senses a paper out condition and causes an alarm condition to exist. This causes the printer motor to stop and the ALARM light to light. The printer motor cannot be turned back on until the paper out condition is cleared.

In addition to the paper out switch, a sensor is available which can be enabled to sense a low paper condition. The standard low paper sensor is mounted on the rear paper entrance pan. An optional front low paper sensor can be located outside the pedestal cover just under the front of the printer. When a low paper condition is sensed, a signal is sent to the Interface circuit board. Depending upon which particular Interface circuit board is being used, one of several actions may be taken: an alarm condition may be triggered; an indicator may be turned on, or the data source may be alerted and no printer action taken.

PAPER TENSION

Tension is applied to the paper through the use of a paper tensioner. The paper tension is controlled by a lever which can be placed in one of two positions. Placing the lever in the LOAD (L) position allows paper to be installed, and disables the Printer motor circuit. Placing the lever in the RUN (R) position applies tension to the paper and enables the Printer motor circuit.

LINE FEED

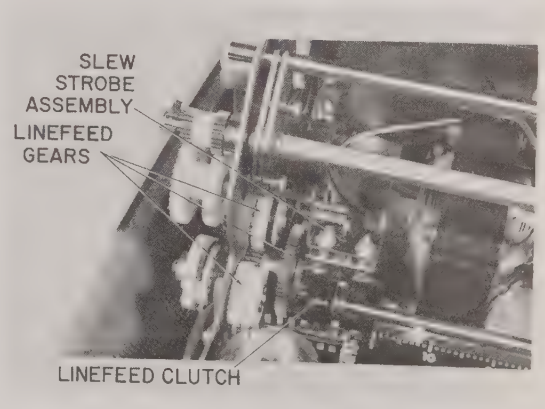
Paper advancement is accomplished by manually rotating the platen knob or by electrical/mechanical feed.

When advancing the paper manually the platen knob is pushed in. This disengages the platen gears from the gears connected to the line feed clutch and allows the platen to be moved manually with the platen knob.

NOTE

The platen knob will not rotate in the reverse feeding direction on early production models.

The line feed solenoid and line feed clutch are the components used for normal line feeds (see Figure 4-6). When a line feed is selected, the line feed solenoid is energized with +25 volts for 12.5 milliseconds. This pulls the line feed solenoid arm away from the line feed cam allowing the clutch to rotate 1/4 of a revolution. This causes gears connected to the line feed drive gear to advance the paper one line. (The anti-backlash spring holds the line feed clutch securely in position and prevents clutch oscillation and wear.) If the 6 or 8 Lines per Inch option is installed, the paper will advance either 6 or 8 LPI depending upon which setting is used.



PLH-8043

Figure 4-6. Line Feed Mechanics

VERNIER TRACTOR ADJUSTMENT

A thumbwheel adjustment screw is located on the right end of the round tie rod extending through the forms tractors. Manually rotating this screw causes a slight lateral movement of both tractors and installed form for precise forms alignment.

SLEW STROBE ASSEMBLY

All TermiNet 310/320/330/340 Line Printers contain

a slew strobe assembly. This consists of a strobe disc attached to the right side of the line feed clutch, and a photo detector which is mounted with a bracket to the left side frame. The slew strobe assembly provides paper slewing capability without the necessity for having the optional VFU. This device causes rapid paper feeding (slewing) upon receipt of appropriate paper slew commands from the data source.

VERTICAL FORMATTING

The Vertical Format Unit (VFU) option consists of a photoelectric tape reading device which is mounted on the left side frame of the printer. The associated electronics (connected through cabling) are located on the Logic (LOG) board. The optional VFU device provides a fast means for advancing paper in the printer to predetermined positions when appropriate paper action codes are received from the data source.

A preprogrammed tape loop is used to control the VFU. When a Vertical Tab code is received, the linefeed clutch will be activated, as described previously for line feeding, causing paper to start feeding at a rapid rate. At the same time, the preprogrammed tape loop will start feeding through the VFU tape reader, and will continue until a VT stop (programmed in the tape) is sensed by the photoelectrics. This will cause the linefeed clutch to deactivate, stopping paper advancement and VFU tape motion.

The same procedure as stated for Vertical Tabulation is used for Form Feeding except that a programmed FF stop in the tape will stop paper advancement.

CAUTION

Use only opaque (black or Mylar) tape in the VFU.

SECTION 3

PRINTED WIRE BOARDS

MOTHERBOARD (LMB)
44C417523

A new mother board (HQMB) is now available for use in the TermiNet 340 Printer. This new board provides added capability and replaces PWB 44C417523-G16. When installed in the TermiNet 340 Printer, the wiring harness connector from the printer mechanism is connected to the HARNESS B connector on the mother board.

HIGH VOLTAGE SWITCHER BOARD (HVS)
44C417519

FUNCTION

Two HVS boards are used in the TermiNet 310/320/330 or 340 Line Printer. Each board is identical to the other one. The HVS boards installed in the even HVS and odd HVS bustle positions control voltages used for firing all of the even and odd hammers respectively. The HVS/3 or HVS/5 boards are for use in the TermiNet 310/320/330 series Line Printer. These boards cannot be used in a TermiNet 340 Line Printer.

The HVS board provides protection against over current or over voltage to protect the hammer coils.

FUSES

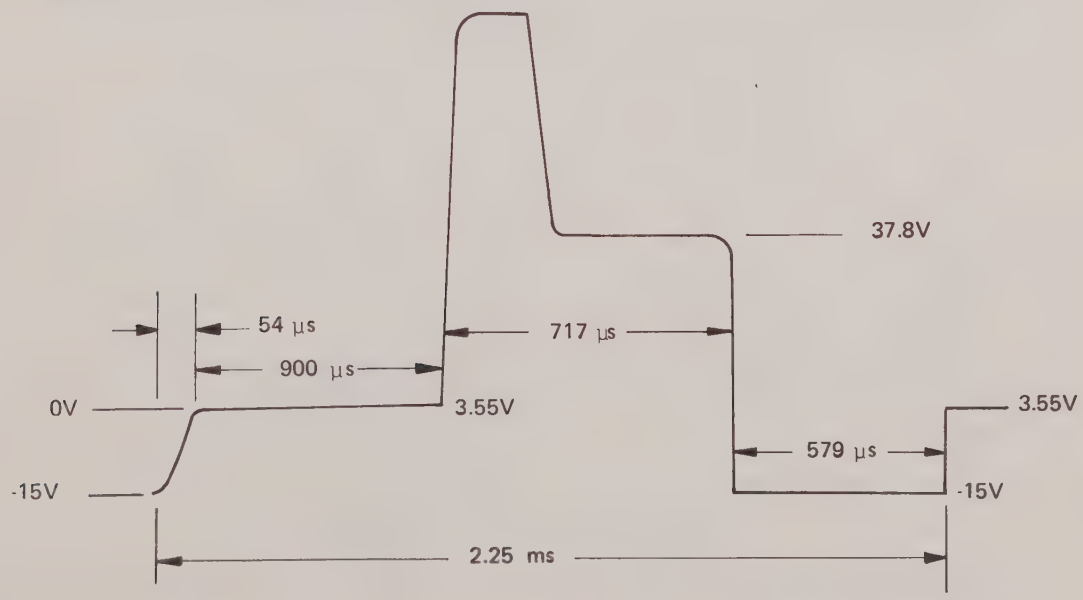
None

STRAPS	HVS/3/5	HVS/4/6
Hit Limit 30:	No	J1 IN J2 & J3 OUT
Hit Limit 8:	J2 IN J1 & J3 OUT	NO

TEST POINTS AND WAVEFORMS

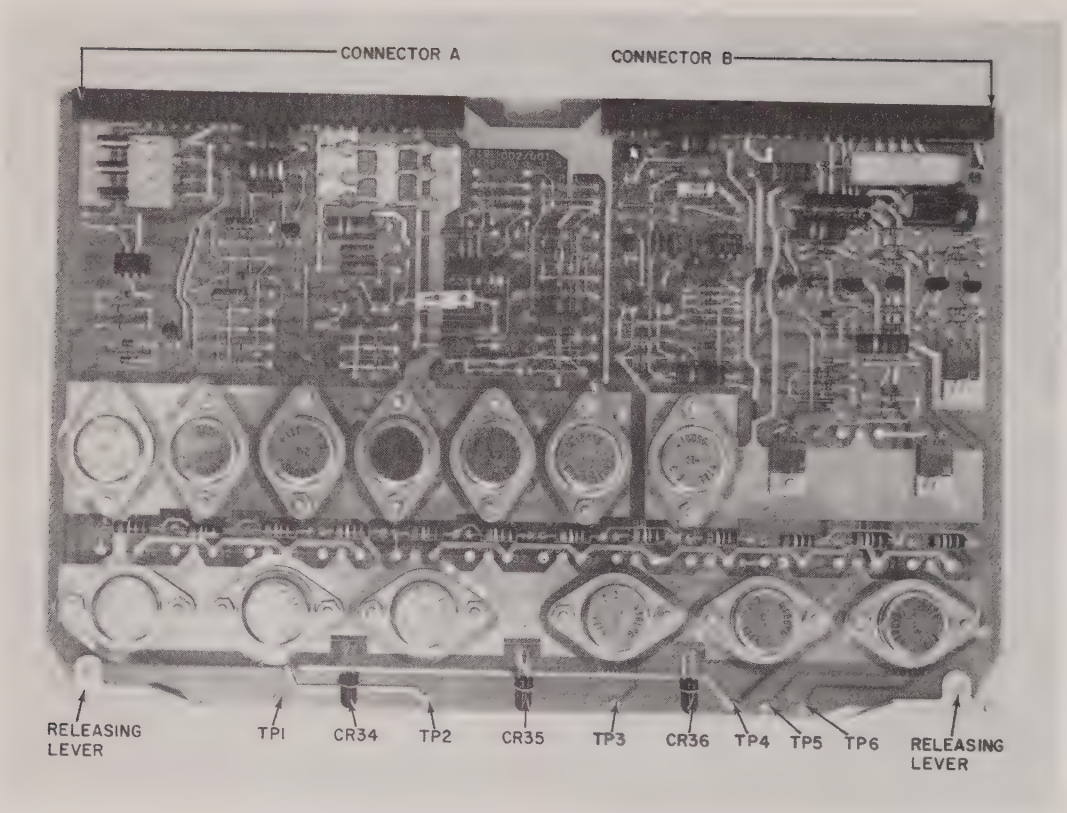
TP1 Crowbar

TP2 EHD (or OHD) Bus Output Voltage. Use TP4 (0V) to reference scope to ground. With test probe on TP2, adjust sweep to observe the following trace.



TP3, TP5, and TP6 - For factory use.

TP4 - 0V



PLH-7033

Figure 4-7. High Voltage Switcher Board (HVS)

PRINCIPLES OF OPERATION (Figure 4-8)

The HVS PWB receives 3 signals from the LOG board (commutate, drive and fire), one signal from PSR (LVS), and several DC voltages from PSR (+109, +15, -15, -25). The HVS processes the above signals to produce a stepped waveform of voltage which is applied to a Hammer Drive Bus (EDB or ODB).

When the print belt is running, the output of one HVS should be as shown above for TP2.

The two input signals (Drive, Commutate) from the LOG PWB perform the following function on HVS. If both Drive and Commutate are off, the input circuits tell the Op Amp to keep the output voltage at the Compare level, approximately 3.5 volts.

When the Drive signal is applied, the input circuits initially tell the Op Amp to cause the output voltage to be approximately 80 volts; then, after a delay of 225 us, the output voltage should drop to 38 volts and stay there until the Commutate signal is applied.

When the Commutate signal is applied, the HVS output voltage goes to approximately -15 volts. It should be noted that the Commutate signal has priority; that is, the Commutate signal forces the

output to -15 volts regardless of what the Drive signal is. The HVS output voltage is forced to -15 volts by the Pull-Down circuit.

The Op Amp itself cannot supply the voltage necessary for the output; therefore, the Op Amp is followed by a stage having a voltage gain of 11. Now sufficient voltage is available but the power is too low.

The power is stepped up in a 4 stage emitter follower. This constitutes the power amplifier.

The protection circuits use a FIRE signal from LOG and a Current Detect signal from the Power Amp to detect repetitive hammer fire (LHD SCR shorted). The protection circuits also detect instantaneous overcurrent and bus overvoltage.

VISUAL INDICATORS

With normal operation CR34 (left side LED) should not glow; CR34 will glow whenever a CBAR output exists.

In normal Printer operation CR35 (center LED) will glow continuously when the print belt is running; otherwise it should not glow.

CR36 (right side LED) will flash intermittently as data is being printed. If no data is being entered, CR36 should not flash.

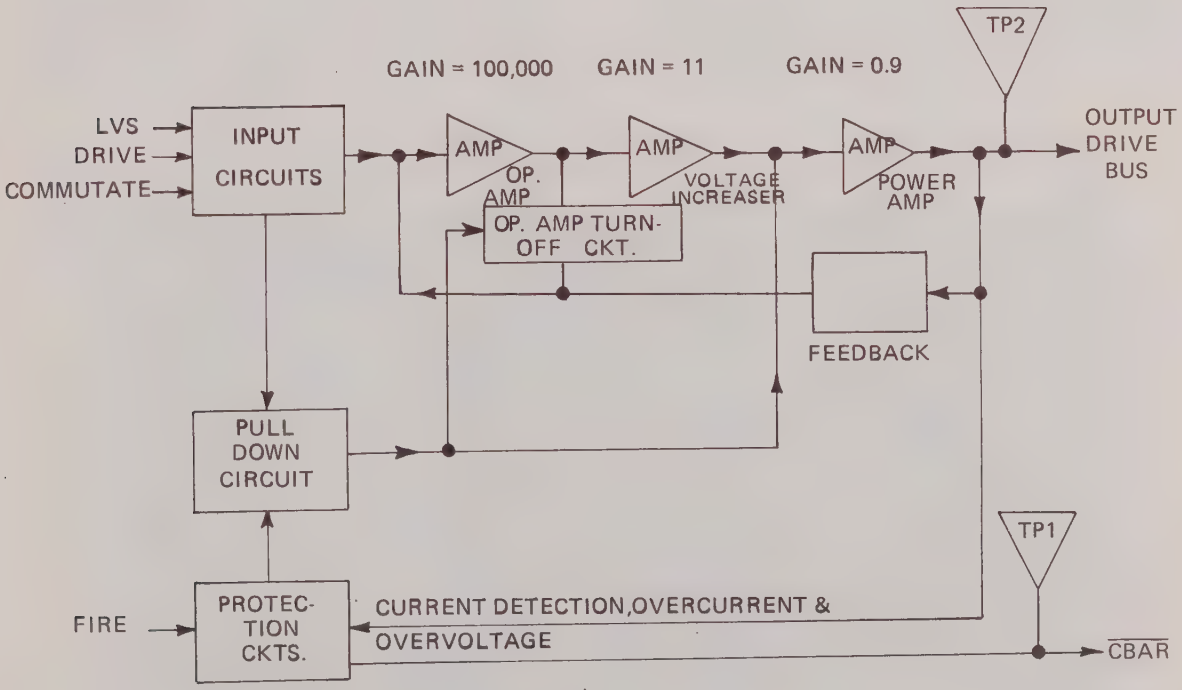


Figure 4-8. High Voltage Switcher Board Circuit Diagram

LINE HAMMER DECODER BOARD (LHD) 44C417513

FUNCTION

The two LHD boards used in the TermiNet 340 Line Printer are identical to each other. Each board controls hammer firing of all odd hammers or all even hammers depending on which bustle slot the board is inserted.

The LHD boards contain an SCR for each hammer position. The fire even (FEH) and fire odd (FOH) signals along with the decoded hammer drive signals which originate on the Logic (LOG) board are received on the LHD boards. These signals are used to control the "turning on" of selected SCR's energizing the associated hammer coils.

Voltages required for switching the SCR's and conducting the solenoid coils are supplied to the LHD boards by the High Voltage Switch (HVS) boards.

FUSES - None

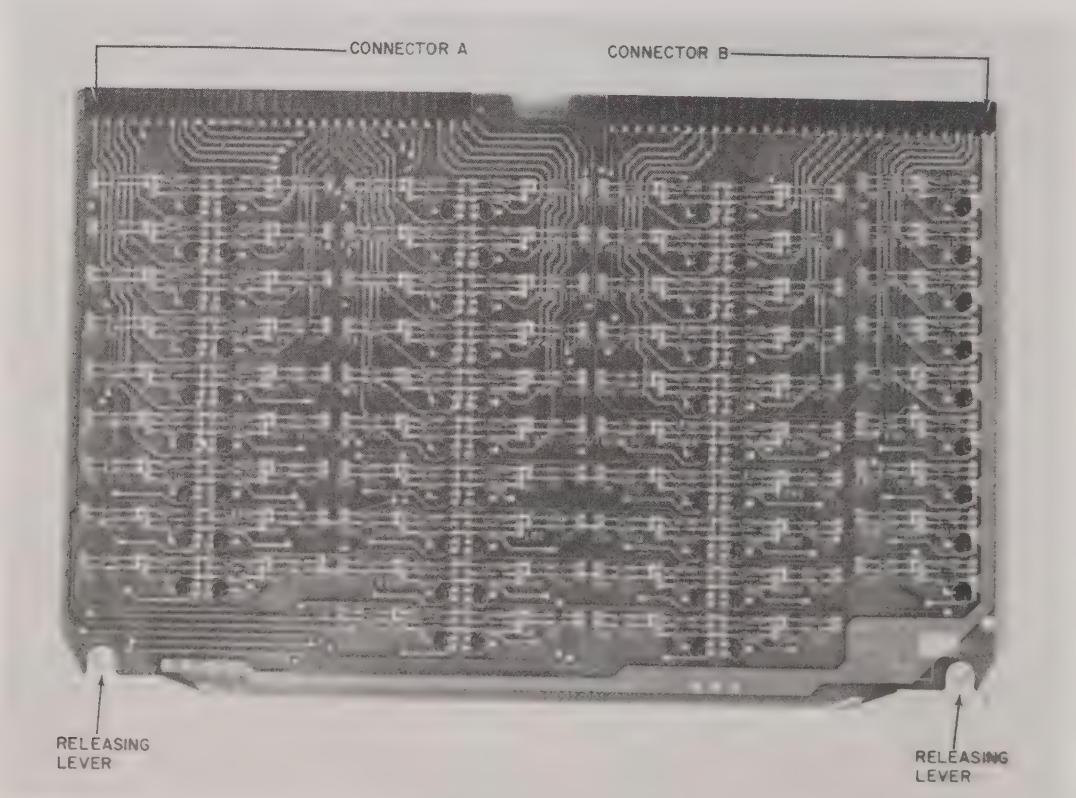
STRAPS - None

TEST POINTS AND WAVEFORMS - None

PRINCIPLES OF OPERATION (FIGURE 4-10)

GENERAL

The Line Hammer Decoder PWB's accept the decoded hammer drive signals from the Column Counter & Decoder (CCDE) logic located on the Logic (LOG) PWB for subsequent decoding that enables the individual hammer solenoid circuits. The LOG PWB also provides two differentiating signals that identify whether the hammer solenoid circuit to be enabled is an even or an odd print position. Within a cycle time of approximately 2.2 milliseconds, up to 30 hammer solenoid circuits can be enabled, fired, and turned off. Since the one group of even hammer solenoid



PLH-7034

Figure 4-9. Line Hammer Decoder Board (LHD)

circuits are being enabled during the firing and subsequent turn-off of a group of odd hammer solenoids, then the two LHD logic arrays, through an interlace pattern, can print up to 60 characters in 2.25 ms under optimum data transfer.

COMPARISON CYCLE

During a 900 microsecond period, up to 30 comparisons are made of the hammer drive signals from the LOG PWB. The hammer drive signals consist of two groups. The one group is in increments of 16 to enable a series of eight odd or eight even gate circuits, while the other group is in increments of two to enable one odd or one even gate circuit within the group of sixteen. The incremented-by-16 hammer drive signals are $\overline{H0}$, $\overline{H16}$, $\overline{H32}$, $\overline{H48}$, $\overline{H64}$, $\overline{H80}$, $\overline{H96}$ and $\overline{H112}$. The incremented-by-2 hammer drive signals are $\overline{HZ}$, $\overline{H2}$, $\overline{H4}$, $\overline{H6}$, $\overline{H8}$, $\overline{H10}$, $\overline{H12}$ and $\overline{H14}$.

To differentiate whether the comparison is for a group of even or a group of odd hammer solenoid circuits, the Belt Counter & Comparer (BCOM) circuits on the LOG PWB provides two signals, Fire Even Hammer (FEH) and Fire Odd Hammer (FOH), thus enabling the LHD gate circuits on the one LHD PWB. Then during the subsequent comparison cycle, enabling the LHD gate circuits on the alternate LHD PWB. Therefore, since either all even, or all odd enabling comparisons occur at any given time, up to 30 even comparisons can be made during the 900 microsecond comparison period. During these alternate interlace periods, up to 30 odd comparisons can be made. The LHD PWB in the odd bustle slot is enabled by the FOH signal, while the LHD PWB in the even bustle slot is enabled by the FEH signal. Thus all odd hammer solenoid decoding gates are located on the LHD/ODD PWB and all even hammer solenoid decoding gates are located on the LHD/EVEN PWB.

To decode at the gate to an SCR for enabling during the comparison cycle, three signals must be present simultaneously. These signals are one of the incremented-by-16 hammer drive signals, one of the incremented-by-2 hammer drive signals, and, if an even print position is to be enabled, the FEH signal. If an odd print position is to be enabled, then the FOH signal would be required. Therefore, although both an even and an odd print position have the same hammer drive signals present simultaneously, the FEH and FOH signal differentiates whether the even or odd gate will be enabled to switch on the SCR controlling the conduction path through a hammer solenoid.

During the comparison cycle, the odd, or even group of decoder circuits will have a positive voltage of approximately 3.5 volts present on the anode of the SCR. The cathode of the SCR is connected to 0 volts potential. Thus, if the gate circuit connected to the SCR gate is enabled by the correct hammer drive signals and the correct differentiating control signal, FOH or FEH, then a positive potential is felt at the SCR gate, switching the SCR into the conduction state. This low voltage (3.5 volts) does not provide sufficient power through the hammer solenoid to cause the hammer to be thrown. Therefore, since all the even, or all the odd SCR's will have this small voltage level applied during the comparison cycle, as the hammer drive signals are generated and decoded, the SCR's of an even group, or the SCR's of an odd group, can be switched on, one at a time, during the comparison period. Hence, during optimum data transfer periods, up to 30 SCR's can be switched on during a comparison period. When the accelerate voltage, approximately +109 volts, is applied to the selected group of SCR's, the 30 hammer solenoids through which a conduction path exists will be simultaneously energized, causing the corresponding hammers to be thrown forward.

ACCELERATE AND HOLD CYCLE

Following the comparison cycle, the accelerate and hold cycle occurs. The accelerate period is for a period of 225 microseconds followed by the hold period of approximately 495 microseconds, for a total of approximately 720 microseconds. During this time the SCR's selected during the comparison cycle will have +109 volts applied at the anode, causing a high current conduction path to exist through the corresponding hammer solenoid. This will pull the selected hammers forward. Once the pull of the hammer is started, the initial high potential necessary to initiate the action is reduced to a potential of approximately +37.8 volts, sufficient to provide a continued pull on the hammer to generate the necessary motion to throw the hammer forward for printing.

The timing of the application of this voltage potential is coordinated by the BCOM logic on the LOG PWB so that the print fingers are in the proper location to provide the correct print character to appear at the proper time on the print belt during application of the accelerate voltage to a particular SCR. This will then enable multiple character printing along the line of print as a result of the correct decoding by the LHD gate logic.

COMMUTATE CYCLE

After the accelerate voltage drops to +37.8 volts, the hold period is terminated by the action of commutating the hammer solenoid voltage to -15 volts. This will reverse bias the SCR anode to cathode potential, stopping the conduction path through the SCR. The commutate cycle is approximately 580 microseconds in duration.

At termination of the commutate cycle, the hammer drive bus voltage level returns to the comparison cycle voltage level of approximately +3.5 volts. This enables passing the selected SCR circuits through another comparison cycle, and repeating the cycle of events described. Control of the voltage level switching is on the High Voltage Switch (HVS) PWB's.

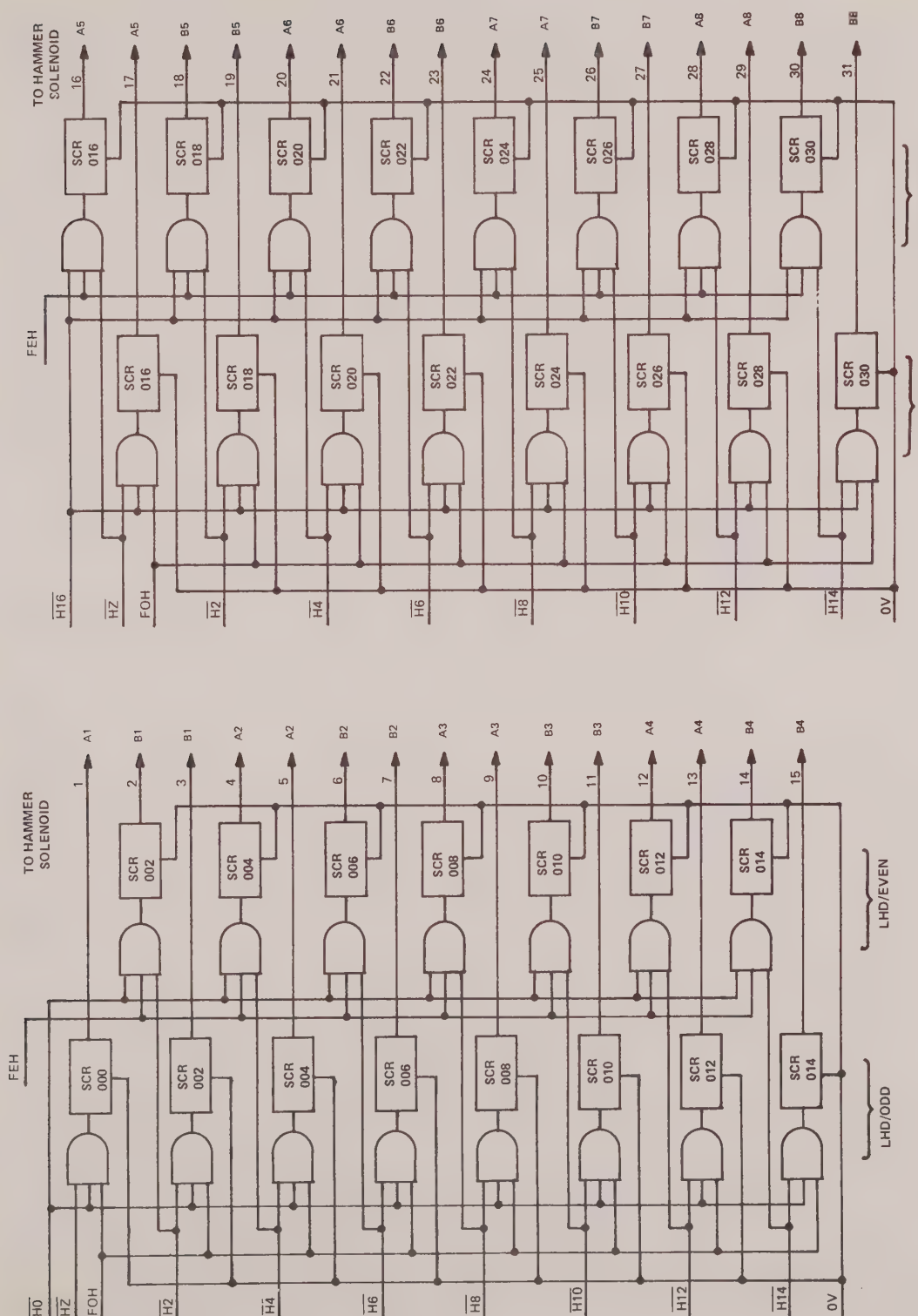
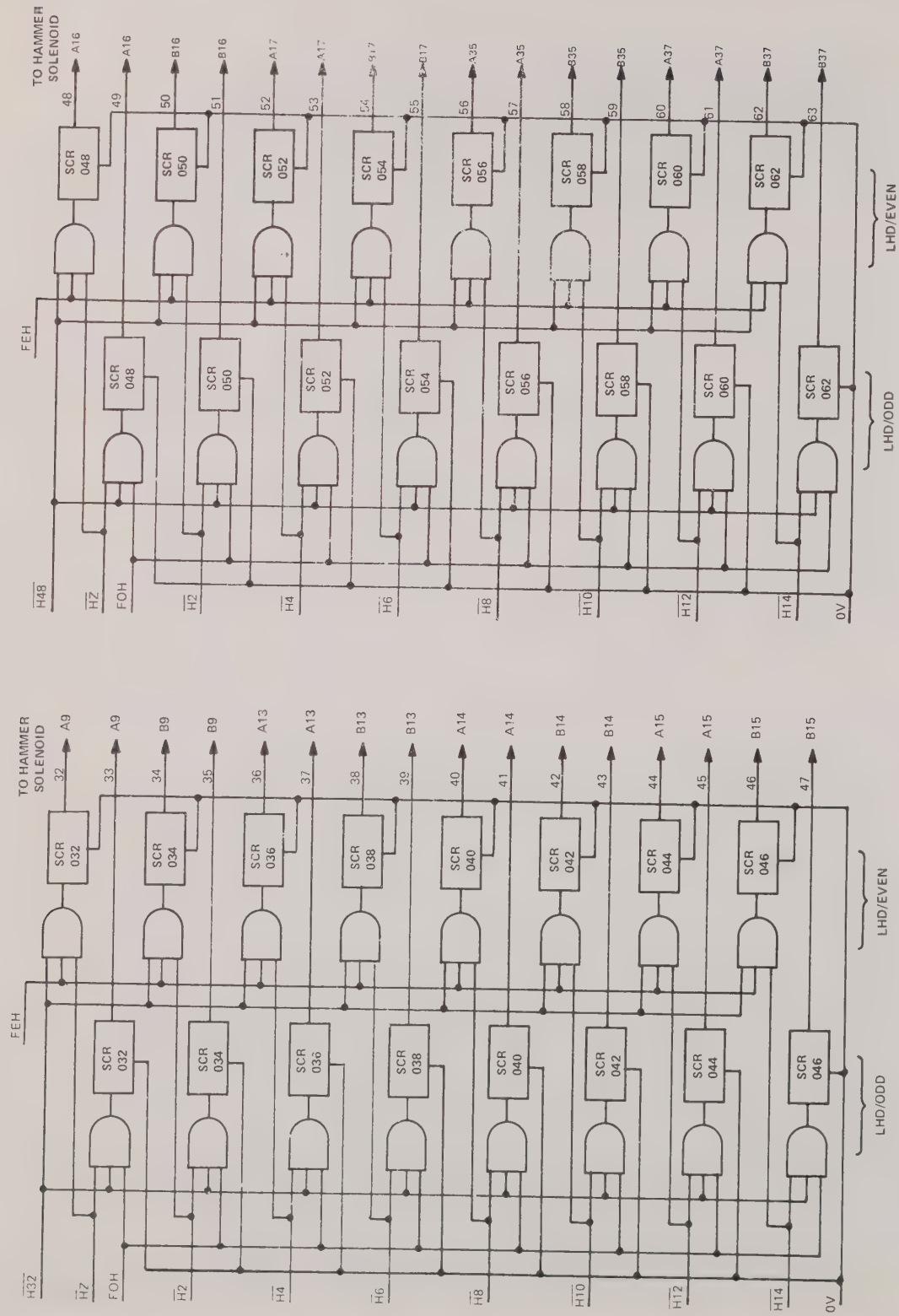
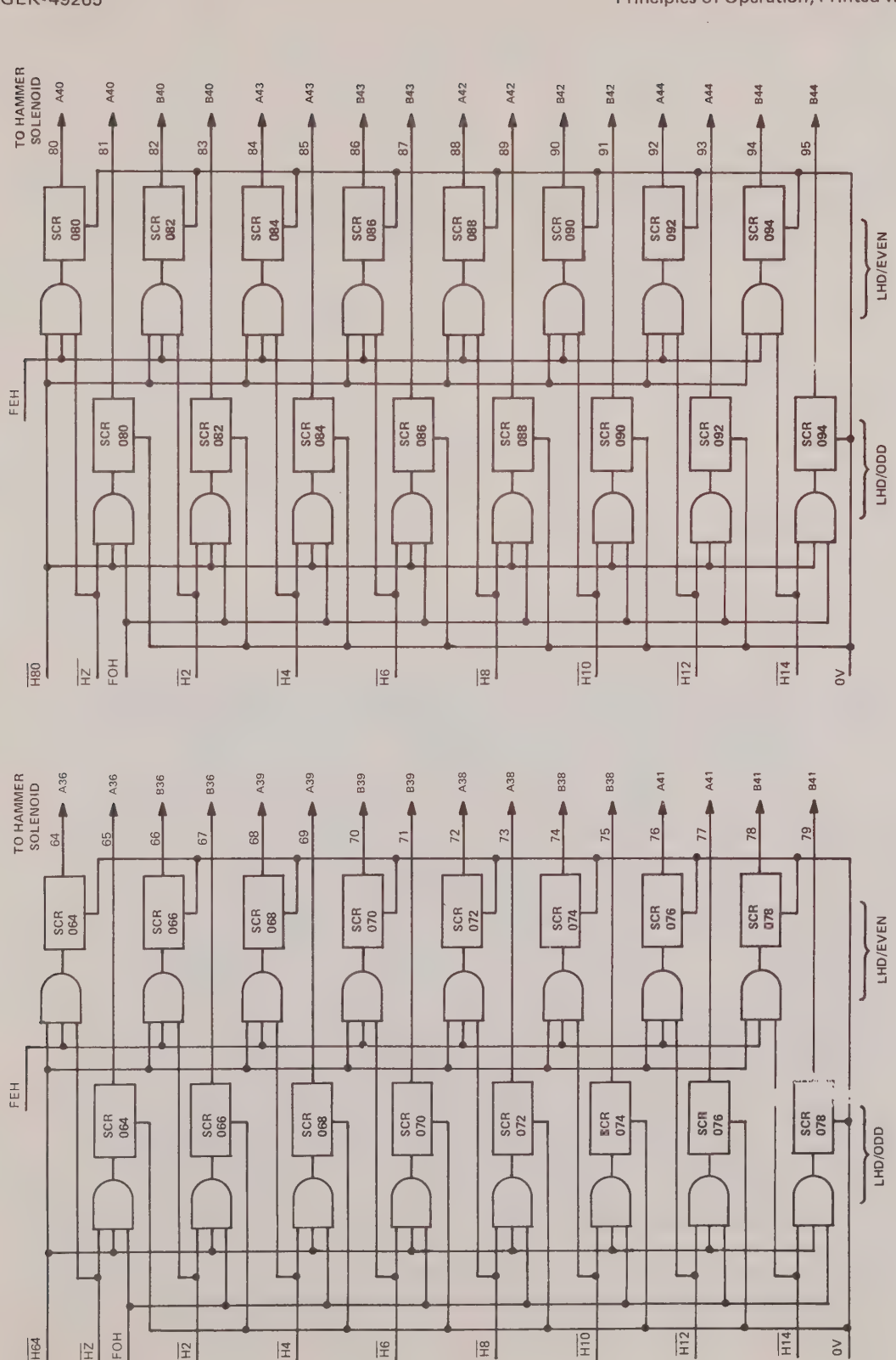


Figure 4-10. LHD Board Circuits (Hammers 1-31) (Sheet 1 of 4)



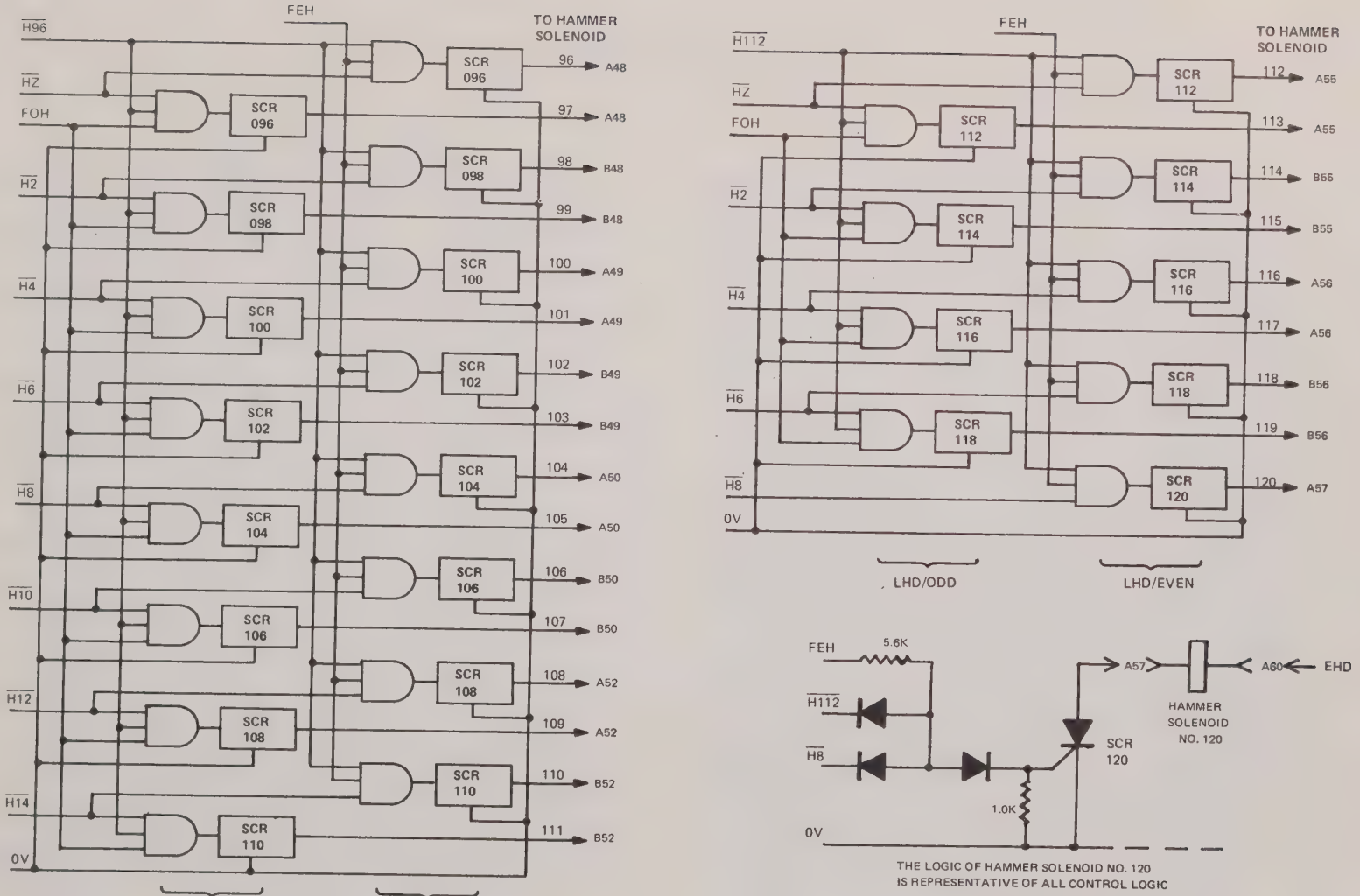
PLL-5053

Figure 4-10. LHD Board Circuits (Hammers 32-63) (Sheet 2 of 4)



PLL-5054

Figure 4-10. LHD Board Circuits (Hammers 64-95) (Sheet 3 of 4)



THE LOGIC OF HAMMER SOLENOID NO. 120 IS REPRESENTATIVE OF ALL CONTROL LOGIC

NOTE - Hammer solenoids 121, (122/123), (124/125), (126/127), (128/129), (130/131), and 132 correspond to pin numbers A57, B57, A58, B58, A59, B60 and A60 respectively.

PLL-5055

Figure 4-10. LHD Board Circuits (Hammers 96-120) (Sheet 4 of 4)

POWER SUPPLY REGULATOR BOARD (PSR) 44C417520

FUNCTION

The PSR board receives raw, unregulated DC voltages from the rectifiers on the XPS board. Functions performed by various circuits on this board are as follows.

1. Regulates the four low voltage (+15, +5, -15, and -12 volt) power supplies.

2. The crowbar circuit turns off the high voltage supply in case of overcurrent detection.

3. Regulates the high voltage +157V unregulated DC power from the XPS board. The output of the high voltage regulator is 109V.

4. The protection circuits sense for high or low voltage conditions.

5. The photoelectric sensing circuits pick up and amplify signals from the print finger phototransistors.

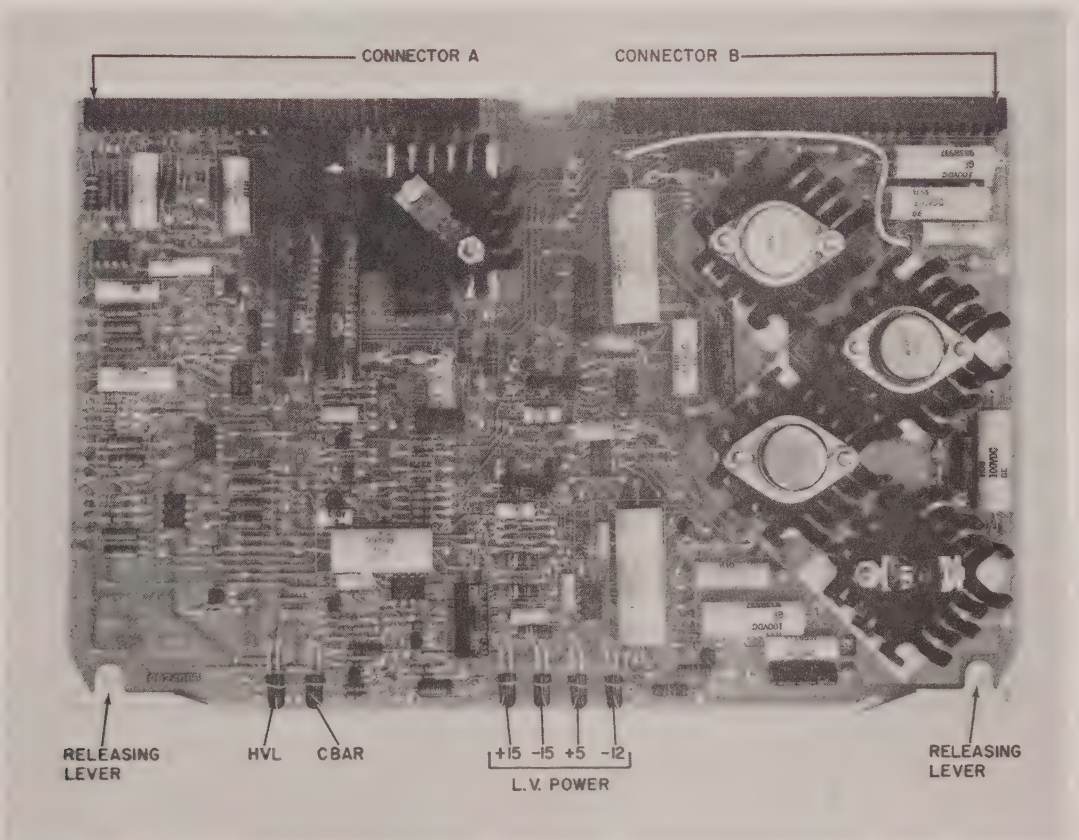
FUSES—None.

STRAPS—None.

TEST POINTS—Not applicable.

PRINCIPLES OF OPERATION (FIGURES 4-12 AND 4-13)

The four low voltage regulators receive low voltage, unregulated power from the rectifiers on the XPS board. These low voltage regulators contain built-in



PLH-7035

Figure 4-11. Power Supply Regulator Board (PSR)

protection against shorts, overvoltage, and heat build-up.

CAUTION

WHEN OPERATING A PSR BOARD ON AN EXTENDER BOARD WHILE TROUBLESHOOTING, HEAT WILL BUILD UP RAPIDLY WITHOUT BENEFIT OF THE COOLING FAN. THIS MAY CAUSE THE REGULATORS TO TURN OFF WHEN THEY BECOME OVERHEATED. AFTER A COOLING OFF PERIOD, THEY WILL RETURN TO NORMAL OPERATION.

The high voltage regulator is inputted by the +157 volt unregulated supply on the XPS board. This regulator contains a "soft start" feature which limits power in-rush. The high voltage regulator along with associated protection circuitry will generate a crowbar signal when the 109V supply drops below 95V or reaches 120V. The high voltage sensing circuit compares the 109V supply with the -5.6V reference voltage.

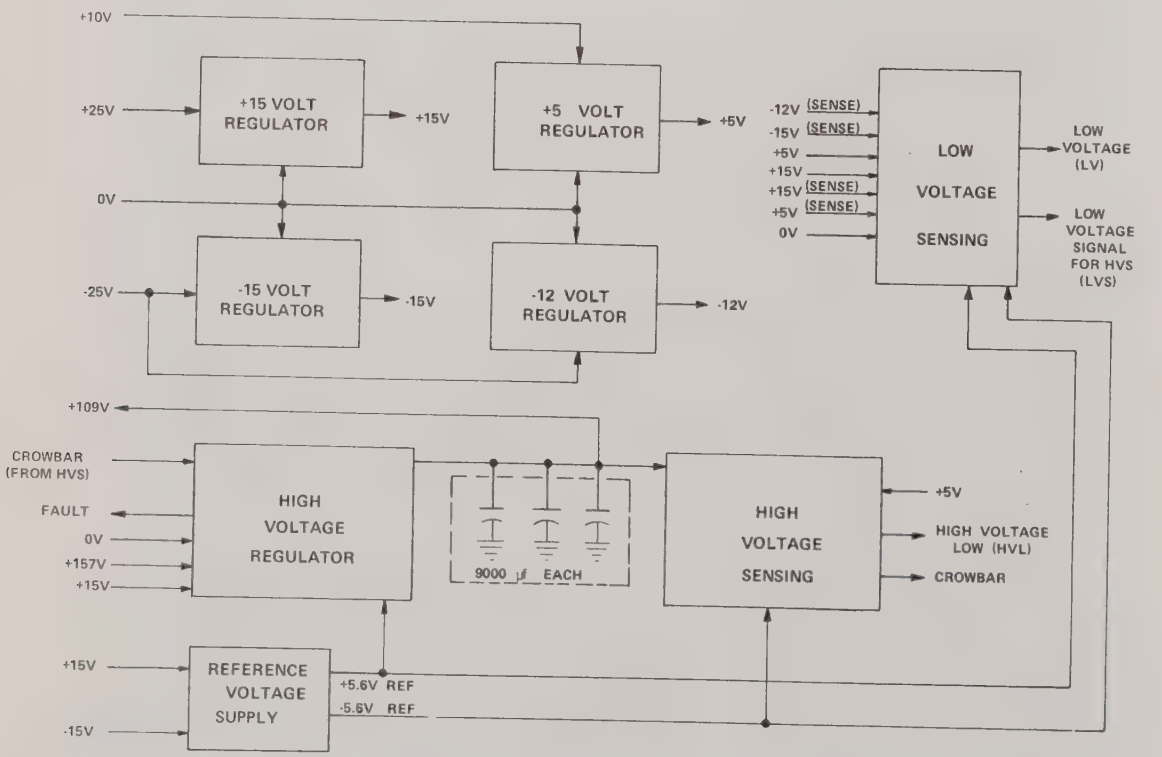
Low voltage sensing circuits monitor the low voltage supplies for correct voltage levels. These protection circuits consist of four integrated circuits which are used for comparing the four low voltage power supplies with the two reference voltages. When a supply goes low, the output signal LVS is sent to the two HVS boards which has the same effect as the commutate signal.

Status indicators located on the PSR board indicate the following abnormal conditions --

CR29 (HVL)	– High Voltage Low Signal
CR30 (CBAR)	– Crowbar Signal
CR31 (+15)	– +15V Supply Low
CR32 (–15)	– -15V Supply Low
CR33 (+ 5)	– +5V Supply Low
CR34 (–12)	– -12V Supply Low

PHOTOELECTRIC PRINT FINGER SENSOR (FIGURE 4-13)

The print finger sensor consists of two light emitting



PLL-5057

Figure 4-12. Power Supply Regulator Circuit Block Diagram

diodes and associated phototransistors. These devices are mounted in such a way that each moving print finger will interrupt a light path from a LED to the associated phototransistor. Circuits which shape and amplify the outputs of the phototransistors are located on the PSR board. To lengthen the life of the LEDs, the Motor signal $\overline{MTR}$ is used for turning the LEDs off when the print belt stops running.

LOGIC BOARD (LOG) 44C417521

FUNCTION

The LOG board (Figure 4-14) has been designed with the necessary flexibility to accommodate the various options available for the TermiNet 310/320/330/340 Family of Line Printers. The LOG/8 is a universal LOG board that replaces all previous groups. LOG/8 has strapping options that will allow it to function with any Line Printer in the TermiNet 340 Family. Previous groups of LOG boards can be used only in particular Line Printer models as indicated below:

LOG	TermiNet LINE PRINTER
LOG/3	340
LOG/4	330
LOG/5	320
LOG/6	310

FUSES

F1 = 1/8A PICO, Phase 1 Clock
F2 = 1/8A PICO, Phase 2 Clock

STRAPS

NOTE

Straps J2 and J3 are not available on LOG/1-7 PWBs.

J2 and J3 OUT - For Model 340
J3 IN, J2 OUT - For Model 330
J2 IN, J3 OUT - For Model 320
J2 and J3 IN - For Model 310
J4 to 80 - 80 column operation
J4 to 120 - 120 column operation
J4 to 132 - 132 column operation

TEST POINTS AND WAVEFORMS

TP1 = VTFF voltage

PRINCIPLES OF OPERATION (FIGURES 4-15 AND 4-16)

INTRODUCTION

The Line Printer Logic Board (LOG) contains the circuitry associated with processing parallel data from the interface (INT board) to the Line Printer print mechanism. This includes processing data to a one-line memory until a full line (80 or 132 characters)

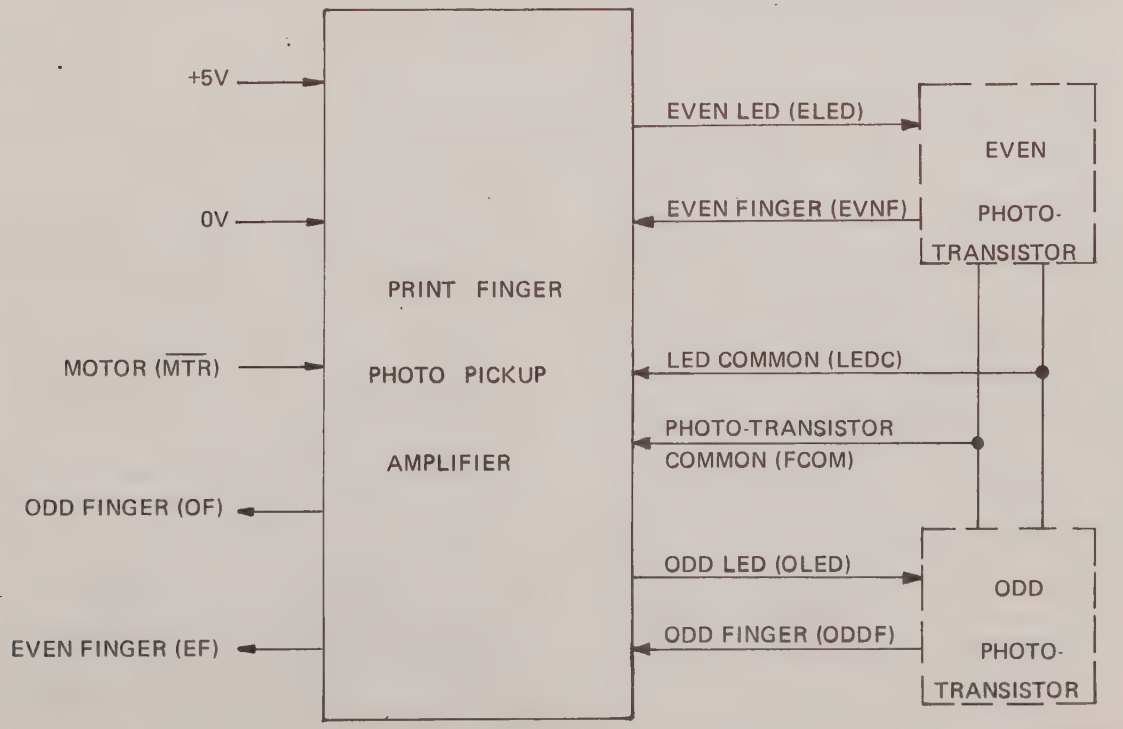
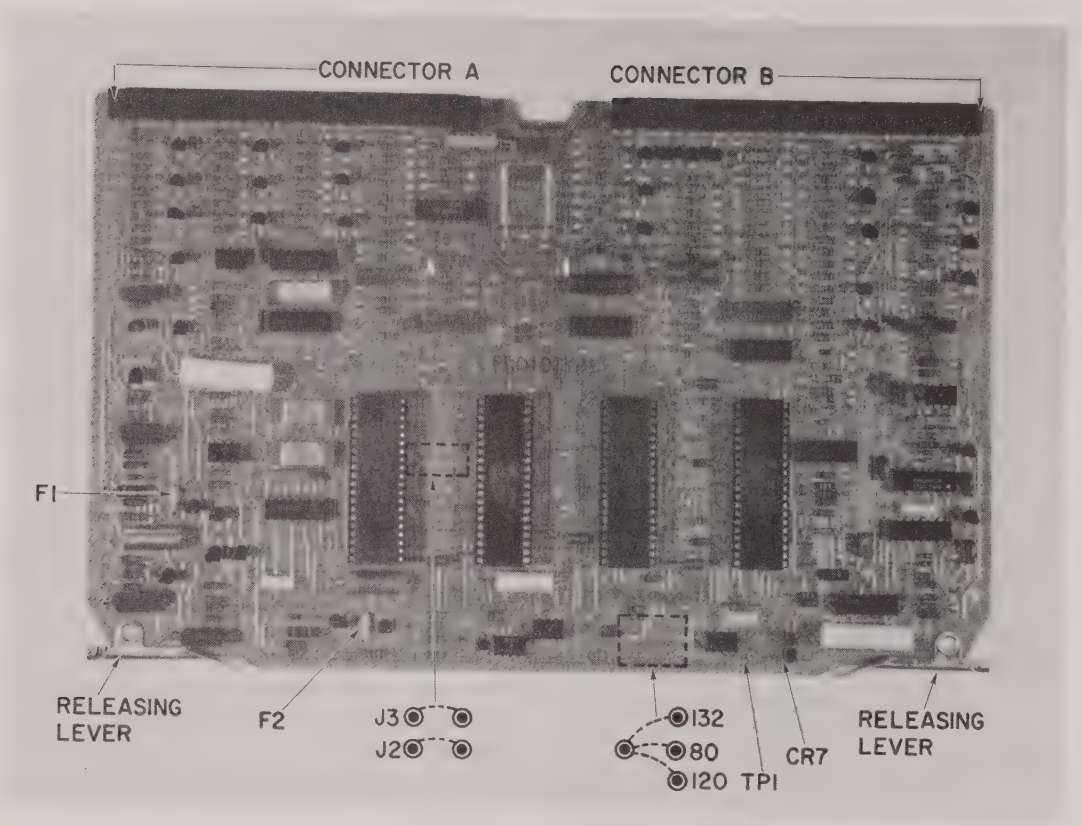


Figure 4-13. Photoelectric Sensor on PSR Board



PLH-8044

Figure 4-14. Logic Board (LOG)
(LOG/8 Illustrated)

has been stored. Upon completion of line storing, the Printer will begin the print cycle which will involve printing the characters in the memory in the correct columns (print positions) at the correct time. As characters are stored in the memory, a column counter will advance in synchronism with the character memory. When characters are read out of the memory, the column counter will advance again in synchronism with the character memory such that the character being read out will have its associated column being read out (from the column counter) at the same time. When the print belt is in the correct position, the column being read from the column counter will cause the activation of that particular hammer solenoid in the hammerbank assembly.

Paper handling logic is also contained on the LOG board. The recognition of a VT, FF, LF, Slew, VT, & LF or FF & LF will cause the LOG board to initiate paper slewing. This portion of the LOG board will work in conjunction with the TVFB photosensor board housed in the Vertical Format Unit to reset the slewing sequence. This will occur after the proper number of linefeeds as dictated by a preprogrammed paper tape loop.

The Motor Control logic and the Alarm logic for the Printer are also found on the LOG board. The Alarm logic will be activated when the Printer is out of paper, when there is a slow speed on the print belt, or when there is a low voltage on any of the power supplies on PSR. A low speed detector has also been incorporated on the LOG board which will cause an Alarm condition when the print belt slows down by approximately 12% of its rated speed.

A Test Generator Circuit will cause the Printer to print out a test pattern when the Test pushbutton on the control panel is pressed. This circuit on the LOG board will feed its outputs directly to the character memory and processing will be the same as though data were received from the INT board. The test function will check all boards except the INT board and the TVFB board.

The LOG board also contains two protection circuits; the Rate Limiter and the Hit Limiter. The Hit Limiter will not allow more than 30 hammers to be driven to the platen simultaneously for the Model 340, or 8 hammers for the Model 330, 320, and 310.*

This protection will prevent drawing more instantaneous current than the +109V power supply can deliver. The Rate Limiter is used to prevent excessive print rates such that after several lines of print, the character-per-second print rate will stabilize at:

510 CPS for model 340
400 CPS for model 330
255 CPS for model 320
200 CPS for model 310

Finally, the LOG board contains the clocking and timing for Printer synchronization. The timing is based on a 2 phase clock system derived from a 3.2 MHz crystal clock oscillator.

DATA PROCESSING - THE LOAD CYCLE (FIGURE 4-15)

Data will enter the LOG board in parallel on lines DB1 through DB7. The data will be sensed at the INPUT DATA LATCHES. With each character sent to the LOG board, an accompanying data strobe pulse ($\overline{\text{DSTB}}$) will be sent to the STROBE CKT. The output signal (DATS) will cause the INPUT DATA LATCHES to strobe the character to the DATA MULTIPLEXER on lines DX1 through DX7.

Paper Control Character

If the character being sent to the INPUT DATA LATCHES is the paper control character, it will not be accompanied by a $\overline{\text{DSTB}}$ pulse. The data will be lost unless it satisfies the condition on INT as a slew command. In that case, a slew strobe will be sent to the INPUT DATA LATCHES. This will cause the character to be sent to the DATA MULTIPLEXER and also to the SLEW LOGIC AND COUNT network. The SSTB pulse will also be sent to the SLEW LOGIC AND COUNT such that the first six bits will enter a six bit down counter. The binary count loaded into the counter is the number of lines of paper to be fed vertically.

NOTE

The paper control character will be sent to the ONE LINE MEMORY but will not be entered due to signal TSR not being true. (TSR is dependent on DSTB.)

Upon entering a slew count, the signal SLG + 32 will come true to the LFG GEN circuit, and line slewing will occur immediately. As the paper tape loop is fed through the Vertical Format Unit, each sprocket hold sends a signal $\overline{\text{SPKT}}$ from the TVFB board which counts down the slew counter by one increment. When the counter reads zero, paper slewing will stop since SLG + 32 will go false. The T - 32 input to the SLEW LOGIC AND COUNT network will cause pulses on SLG + 32 each T - 32 time. While paper is slewing, data may be entered into the DATA MULTIPLEXER and the ONE LINE MEMORY at the transfer rate. The SSTB signal will be present only during the paper control character time as established on the INT board while the Printer is in the LOAD cycle. A low voltage (LV) condition in the power supplies on PSR will cause the slew counter to reset.

Data Strobe Circuit

Each DSTB signal from INT will go to the STROBE CKT, producing a DATS and a DSTB output. The $\overline{\text{DSTB}}$ output will go to the STROBE MUX which will output the signal TST + DS. This signal will pulse once for each $\overline{\text{DSTB}}$ received. The TST + DS signal will go to the LOAD ÷ 2 circuit. For every two data strobes, one LCTR signal will be sent to the TIMING CC LOGIC network. This will cause the signal TCC to increment the COLUMN COUNTER by 2. The counter will count in the sequence 2, 4, 6, 8, etc., through 66 and then reset to zero. The signal TST + DS will also cause the signal TSR to be sent to the ONE LINE MEMORY. A double pulse on TSR will clock 2 characters at once into the memory. It will also cause all characters in the memory to be shifted two places. This process will only occur during the LOAD cycle. Essentially, characters are loaded into the memory in pairs as the column counter counts by 2. The ONE LINE MEMORY will hold 132 characters when the COLUMN COUNTER reaches 66; or 80 characters when the COLUMN COUNTER reaches 40.

Load Logic Network

The LOAD LOGIC network will set the data loading

*TermiNet 340 Printers built after Nov. 1, 1979 provide only 8 hit limit capability.

cycle. When $\overline{XFR}$ turns off, the LOAD LOGIC network will send the LOAD signal to enable the LOAD MUX, the INHIBIT FIRE circuit, and the LOAD FF. The LOAD MUX circuit will output a pulse every DSTB time to the END OF LINE circuit. The END OF LINE circuit will receive outputs from the COLUMN COUNTER. It will output pulses when the counter output is 40 (80 characters stored) and 66 (132 characters stored). A strap J4 will be positioned such that at one of the 2 counts, the FONT (FULL COUNT) signal will be sent to the INT board. This will cause a signal to be sent to the data source indicating a busy indication. The computer will send no more data until the print cycle is complete. Also, the INT board will turn on $\overline{XFR}$ which will be fed back to the LOAD LOGIC network to turn the LOAD signal off. This will initiate the beginning of the print cycle. When the printing of data is complete, the PC signal will turn on at the input to the LOAD LOGIC network. When the $\overline{XFR}$ turns off, the signal LOAD will again turn on and another line of data will be transferred to the memory.

Timing CC Logic Network

The TIMING CC LOGIC network will control the upward incrementing of the COLUMN COUNTER. While in the load cycle, it will perform as follows:

TCC = INFIRE AND LCTR

The RESET CC LOGIC will perform according to this equation.

RCC = INFIRE AND (LFF AND CC = 66).

The COLUMN COUNTER will reset on the count of 66 indicating that the character memory is full. The reset pulse RCC will also cause the LOAD FF to reset.

Test Generator

When the Test pushbutton on the control panel is pressed, the signal $\overline{TSTX}$ will set the TEST FF. This will cause the signal TST to be sent to the TEST GEN counter which will begin to count at the phase 2 clock rate from 32 through 127. The outputs from the counter will feed the DATA MULTIPLEXER and will be stored in character memory as with other data. The $\overline{TSTL}$ output from the TEST GEN will allow the data to pass from the DATA MULTIPLEXER to the ONE LINE MEMORY. The LOAD input must also be true. The TST output from the TEST FF will also cause the STROBE MUX network to turn on the TST + DS signal for the length of the self test. The TST + DS signal when received at the LOAD ÷ 2 circuit will cause LCTR pulses to be generated for every other count of the TEST GEN. The TSR signal will be generated by TST + DS for the length of the self test. Therefore, data characters will be entered into memory at the phase 2 transfer rate.

The TEST GEN counter will continue to count as long as TST is on. The counter will count from 32 through 127 and then reset to 32 repetitively. The ASCII printable graphics will be stored in the ONE LINE MEMORY until 191 characters have been sent. Assuming the memory to be clear, the first 132 characters will enter the memory. The COLUMN COUNTER will send one 159 pulse to the LOAD LOGIC when 59 characters have been entered into memory. When the memory is full, the COLUMN COUNTER will reset and data will be written into character memory over data previously stored until the COLUMN COUNTER outputs the next 159 pulse. The second 159 pulse will cause the LOAD LOGIC to turn off its LOAD output to begin the print cycle. Therefore, the TEST GEN circuit will have generated 132 + 59 = 191 characters, one less than the number of fingers on the print belt. When the characters in memory have printed, the PC (print complete) signal will reset the TEST FF. The PC signal will also initiate one linefeed at the LF TIMER AND LOGIC circuit. The next self test line will start one character later such that multiple lines from the self test will print a staggered character pattern.

The TST and 159 inputs to the LOAD LOGIC network will override the $\overline{XFR}$ signal from the interface. When TST turns on, LOAD immediately comes true. When the second 159 pulse arrives, LOAD will go false. The PC signal will cause LOAD to go true again.

NOTE

The self test circuit will check all circuitry in the Printer except the SLEW LOGIC AND COUNT, the $\overline{FORM}$ FF, the TAB FF, the Vertical Format Unit, and the INT printed circuit board.

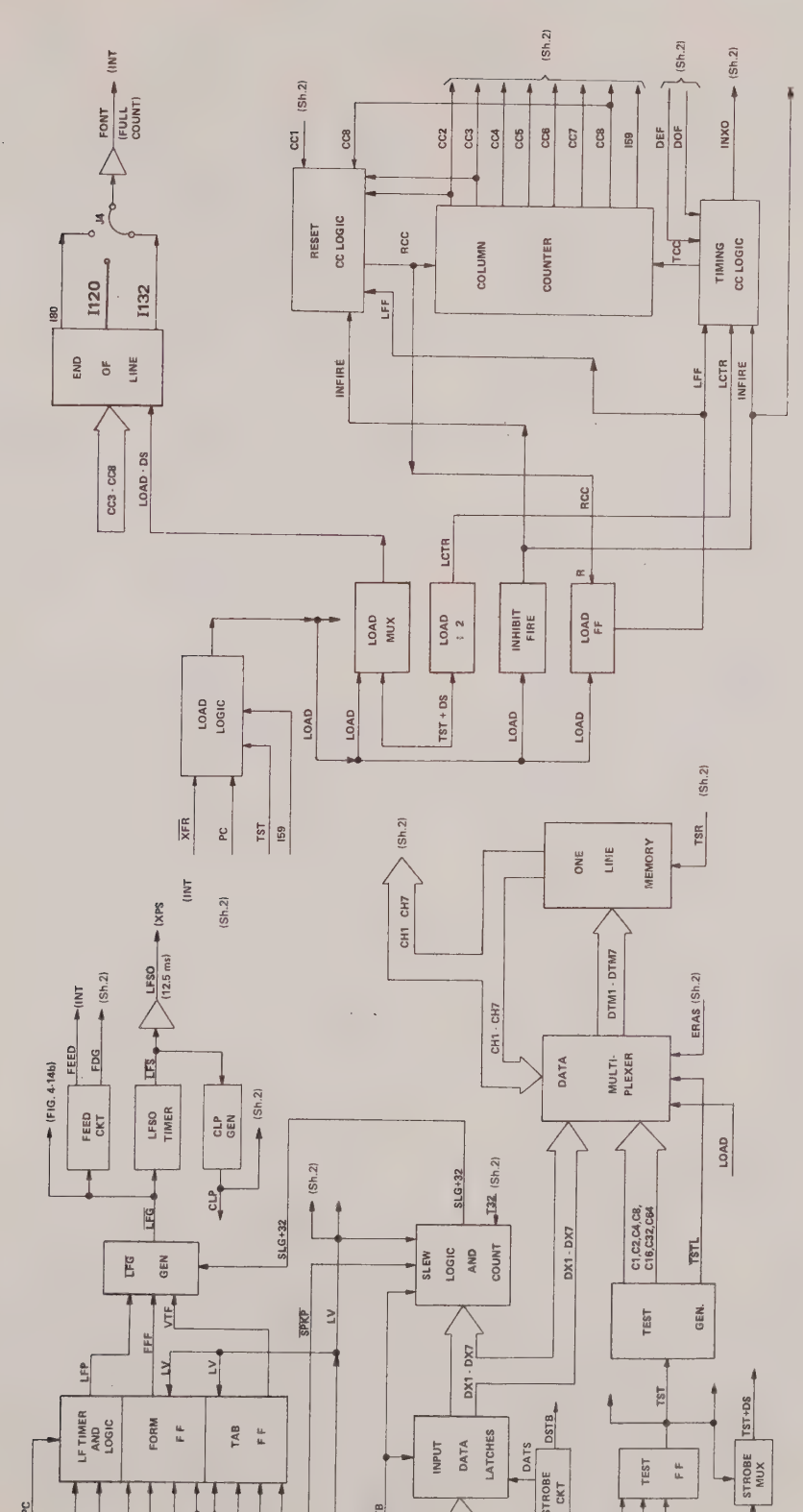


Figure 4-15. Logic Board Circuit Diagram (Sheet 1 of 2)

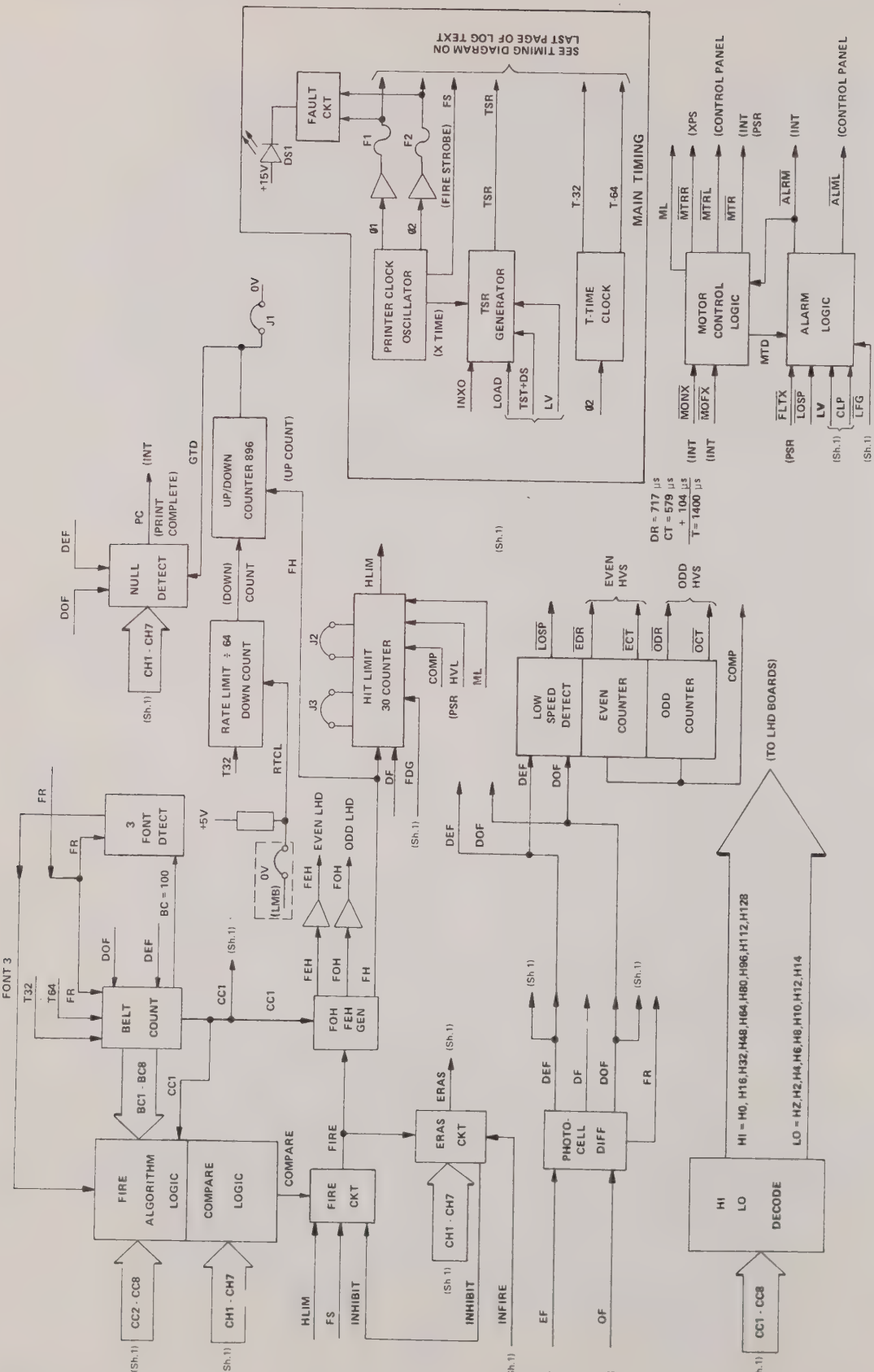


Figure 4-15. Logic Board Circuit Diagram (Sheet 2 of 2)

PAPER HANDLING LOGIC (FIGURE 4-15)

When the $\overline{LFX}$ signal is sensed by the LF TIMER AND LOGIC network and TST is false, the output $\overline{LFP}$ will be sent to the LFG GEN circuit. This will cause the signal $\overline{LFG}$ to be sent to the LFSO TIMER. The output pulse, $\overline{LFS}$, is amplified and sent to the XPS board as LFSO. The LFSO signal will cause the line feed solenoid to be energized for 12.5 ms to initiate an approximate 25 ms mechanical linefeed.

Feed Circuit

The $\overline{LFG}$ signal will also be sent to the FEED CKT which will output the FEED signal to the INT board. The signal FDG will also be sent to the HIT LIMIT 30 COUNTER to prevent printing during paper feeding. Finally, the $\overline{LFS}$ signal turning off will be sent to the CLP GEN circuit. This will reset the FORM FF and the TAB FF after linefeeding. This function will prevent premature triggering of a vertical tab or form feed.

Form Feed and Vertical Tabulation Circuits

When the FFX signal arrives at the FORM FF, the circuit will output the signal FFF. This will cause the LFG signal to be sent to the LFSO TIMER and linefeeding will occur if a paper tape loop is installed in the Vertical Format Unit. When an output from the Form Feed Photocell in the TVFB board arrives with a sprocket photocell pulse, the FORM FF will reset to stop linefeeding. The TAB FF will work identically. Channel 1 in the paper tape loop is reserved for Form Feed and channel 6 is reserved for Vertical Tabs. A low voltage (LV) will reset both the FORM FF and the TAB FF circuits. Again, the signals FEED and FDG will be sent to perform the same functions as described previously.

DATA PROCESSING - THE PRINT CYCLE (FIGURE 4-15)

When the signal XFR turns on at the LOAD LOGIC network, the signal LOAD will turn off. When this happens, the Printer will immediately enter the print mode. The ONE LINE MEMORY and the COLUMN COUNTER will then be in synchronism from the load cycle. A steady double pulse on TSR to the ONE-LINE MEMORY will now be present throughout the print cycle. This will cause all characters in memory to be clocked out of the memory on output lines CH1 through CH7. These lines will feed the COMPARE LOGIC (Figure 4-15) and also back through the DATA MULTIPLEXER into the input of the ONE LINE MEMORY on lines DTM1 through DTM7. This will continue until all characters have been printed. One double pulse (TSR) will be sent to the ONE LINE MEMORY every 8.75 us shifting 2 characters out of the memory. The cycle time for this operation is 577.5 us. This is less time than it takes the print belt fingers to move one print position. Thus, every other character in memory can be read by the COMPARE LOGIC before the print fingers move one print position.

Compare Logic

The printbelt moving counterclockwise will have all print fingers moving to either the odd print positions or the even print positions, but not both simultaneously. Thus, the COMPARE LOGIC (Figure 4-15) is concerned only with the characters in memory stored for even or odd columns but not both. Hence, while the print figures are moving to even print positions will be considered. Likewise, the TSR double pulse will occur such that at the second pulse, an even-stored character will be at the COMPARE LOGIC when the print fingers are moving to even print positions. An odd-stored character will be there when the print fingers are moving to odd positions.

The COLUMN COUNTER will likewise increment steadily by two's during the print cycle. The TIMING CC LOGIC now increments on each TCC pulse which occurs once each 8.75 μs. Since it increments by two each time, it is kept in synchronism with the ONE LINE MEMORY as was true in the load cycle. The signal TCC will be sent in the print cycle according to the logic equation;

$$\emptyset 2 = TCC = (\overline{INFIRE} + \overline{LFF}) \text{ AND } \overline{RCC}$$

The RESET CC LOGIC will send RCC to reset the COLUMN COUNTER according to the equation;

$$RCC = \overline{INFIRE} \text{ AND } CC = 132$$

Hence, the COLUMN COUNTER outputs CC2 through CC8 will have an even count being sent to the FIRE ALGORITHM LOGIC for each character being considered again at the COMPARE LOGIC.

The TIMING CC LOGIC circuit will also receive the DEF (even finger pulse) and the DOF (odd finger

pulse). Signal DEF will come true when print fingers are moving to even print positions and DOF will come true when moving to odd print positions. This will cause the signal INXO to be true during even time and false at odd finger time. The INXO pulse will be sensed by the TSR circuitry such that TSR timing will change for each finger time. When INXO is true, TSR at the ONE LINE MEMORY will double pulse to have even-stored characters at the COMPARE LOGIC. When INXO is false, TSR will cause odd-stored characters to appear at the COMPARE LOGIC.

DATA PROCESSING - THE PRINT CYCLE (FIGURE 4-15)

The BELT COUNT circuit on LOG will count upwards from 32 through 127 and then reset to 32. It will increment upwards on each DEF pulse. The DEF pulse will arrive when the print fingers pass over the even print positions and start to the odd positions. The BELT COUNT will be sent to the FIRE ALGORITHM LOGIC on lines BC1 through BC8. This will occur at T64 time and the FIRE ALGORITHM LOGIC will hold this count until the next T64 time. The T32 time input will cause the BELT COUNT to increment if DEF is true. The signal FR (FONT RESET) will be sent when light is blocked from the even and odd photocells simultaneously. This will happen when the print belt reference tabs are in front of both photocells. The FR signal will reset the BELT COUNT to 32.

Belt Count Circuit

The print fingers are inserted into the print belt in the order used in the ASCII code. That is, the printable graphics of the ASCII code are decimal 32 through 127. Likewise, the print belt has the print finger for character 32 inserted preceding the print finger for 33 etc., through 127. This gives 96 print fingers in one print set or font. The print belt has two fonts of 96 fingers per font. This means that 192 print fingers are inserted in the print belt. Each font is separated by a reference tab which causes FR to be generated on the LOG board. The signal FR tells the LOG board to consider the next print set. It does this by resetting the BELT count to 32. The position of the photocell and the print finger spacing is such that when the BELT COUNT is 32 the 32 character print finger is in front of print position one. The finger spacing in the print belt is such that the 33 character print finger is in front of print position three and so on. When the BELT COUNT is 65, it means that the 65 character print finger is in front of print position one. Therefore, the 66 character print finger is in front of position 3 and so on. The "A" finger and "B" finger are in front of print positions one and three respectively in this example. Thus, the BELT COUNT circuit will keep track of where the print fingers are in relation to print columns or positions.

The BELT COUNT circuit will also provide a CC1 output which will be true when print fingers are moving to odd print positions (DOF) and false when moving to even print positions (DEF). This will give the odd count to the column count inputs to the FIRE ALGORITHM LOGIC when odd-stored characters and columns are being considered for printing.

Fire Algorithm Logic

The FIRE ALOGORITHM LOGIC will perform an addition of the BELT COUNT outputs BC1 through BC8 and the COLUMN COUNTER outputs (Figure 4-15) CC1 through CC8. The addition algorithm for a two font belt is as follows:

$$BC + \frac{CC}{2}$$

The column count will be divided by 2 first and then added to the belt count. If the output from the FIRE ALGORITHM LOGIC is between 32 and 127, this output will be compared with the character then present at the COMPARE LOGIC. If the BC + CC/2 = CH, a compare is the result. An output pulse will then be sent to the FIRE CKT.

Fire Circuit

If the output from the FIRE ALGORITHM LOGIC is $\geq$ 127, the binary equivalent of 96 will be subtracted from the BC+CC/2 and then compared.

When the COMPARE pulse arrives at the FIRE CKT, the output FIRE will result. FIRE will be strobed out of the FIRE CKT when FS comes true. The INHIBIT and HLIM inputs must be off. When the FIRE signal arrives at the FOH FEH GEN circuit, an FH pulse will be sent. Also, if CC1 is true (odd column) FOH will be sent to the LHD/ODD PCB. If CC1 is false, FEH will be sent to LHD/EVEN.

Erase Circuit

The outputs from the ONE LINE MEMORY are sent to two places on the LOG board other than the COMPARE LOGIC. The CH1 through CH7 outputs will also be sensed at the ERAS CKT. If the character is a control code or a space code the ERAS CKT will output the signal INHIBIT which when sensed at the FIRE CKT will cause the FIRE signal to be inhibited for that character time. Also, the output ERAS pulse will be sent to the DATA MULTIPLEXER (Figure 4-15) to erase that character from memory. This will happen only in the print cycle (INFIRE to the ERAS CKT is off). During the load cycle, the INHIBIT signal will be true thereby inhibiting all FIRE pulses. The FIRE pulse will strobe out the signal ERAS for the printing characters.

Null Detect Circuit

The outputs CH1 through CH7 will also be sent to the NULL DETECT circuit. The NULL DETECT circuit will scan the ONE LINE MEMORY outputs CH1 - CH7 as data is being read out. Assume that the print fingers just crossed the even print positions. The signal DEF will set the NULL DETECT CKT. If there are any characters in memory, a logic 1 on any input (CH1 - CH7) will reset the NULL DETECT circuit. If there are no characters in memory, the NULL DETECT CKT will remain set. When the DOF pulse arrives it will cause the output PC (print complete) to be generated ending the print cycle. The GTD input will cause a delay in sending PC. This will occur when the Printer is in a rate limiting mode during the print cycle.

3-Font Detect Circuit

The 3 FONT DTECT circuit is used when a three-font print belt is used. With a two font belt, the signal FR will set the 3 FONT DTECT circuit. When the BELT COUNT reaches 100, the BC=100 signal will reset the 3 FONT DTECT. No output will result from the circuit. When a three-font belt is used, the FR pulse will set the 3 FONT DTECT circuit. The next FR pulse will arrive when the BC=95. In that case, the FONT 3 output will be sent to the FIRE ALGORITHM LOGIC.

When the FIRE ALGORITHM LOGIC receives the FONT 3 signal, it will change the algorithm to conform to the following equations:

IF	THEN COMPARE
$32 \leq (\frac{CC}{2} + BC) \leq 95$	$BC + \frac{CC}{2} = CH$
$96 \leq (\frac{CC}{2} + BC) \leq 159$	$BC + \frac{CC}{2} - 64 = CH$
$(\frac{CC}{2} + BC) \geq 160$	$BC + \frac{CC}{2} - 128 = CH$

Hi Lo Decode Network

The COLUMN COUNTER outputs CC1 through CC8 are also sensed at the HI LO DECODE network on LOG. As each column (print position) is read from the counter, the HI LO DECODE network will electronically switch open one HI line and one LO line. These outputs will be sent to the LHD boards. The outputs will be used in conjunction with FOH or FEH on the LHD boards to place a ground on the particular column solenoid associated with the column being read from the counter. If the CC1 - CC8 count from the COLUMN COUNTER is 38, then HI line H32 and LO line H6 will be opened momentarily. This will select coil number 38 on the even LHD board and coil 39 on the odd LHD board. The signal FEH will cause coil 38 to receive a ground and FOH will cause 39 to receive a ground. Notice that H32 + H6 = 38.

As the print belt moves from even columns to odd columns, odd coils will be grounded if the print belt is in the correct position for the characters being read from memory to print in the correct columns. This is determined by the algorithm logic. Up to 30 odd columns can receive grounds during this time. When the print fingers are almost directly in front of the odd hammers, a high voltage pulse will be sent to all odd hammer solenoids. Those solenoids that were grounded will be activated thereby printing up to 30 odd print positions simultaneously. The same sequence for printing even columns takes place when the fingers are moving from odd columns to even columns.

'HVS TIMING (FIGURE 4-15)

The Photocell PWB on the hammerbank subassembly will send electronic pulses from its photocells to the PSR PWB. The PSR board, after amplifying the two photocell outputs will send these outputs to the LOG

board as EF and OF. These signals will be sent to the PHOTOCELL DIFF network. This circuit will output the DEF and the DOF pulses at the proper time. The DF pulse will be sent for each DEF and DOF pulse. The FR signal will be sent when EF and OF occur simultaneously (light blocked from both photocells caused by passing of the reference finger).

Low Speed Detect Circuit (Figure 4-16)

The DEF and DOF pulses will be sent to the LOW SPEED DETECT circuit, the EVEN COUNTER, and the ODD COUNTER. The DEF pulse will enable the even counter to start counting. It will stop counting and reset when DOF arrives. If the count in the even counter reaches 288, the signal $\overline{LOSP}$ will be sent from the LOW SPEED DETECT circuit. This represents a time of 288 x 8.75 µs = 2520 µs, indicating an approximate decrease in print belt speed of 12%. The ODD COUNTER will function in the same manner. The $\overline{LOSP}$ signal will be sent to the ALARM LOGIC.

Drive and Commutate Signals

The EVEN COUNTER and ODD COUNTER will output 3 signals each. The EVEN COUNTER will send the $\overline{EDR}$ signal (even drive) and the $\overline{ECT}$ signal (even commutate). These signals will be sent to the EVEN HVS to develop the high voltage drive pulse to the even hammerbank solenoids. The EVEN COUNTER will also send the $\overline{COMP}$ signal during the time that the fingers travel from odd print positions to even print positions. The ODD COUNTER will do the same. The $\overline{COMP}$ signal will vary in time duration with small fluctuations in printbelt speed. The drive

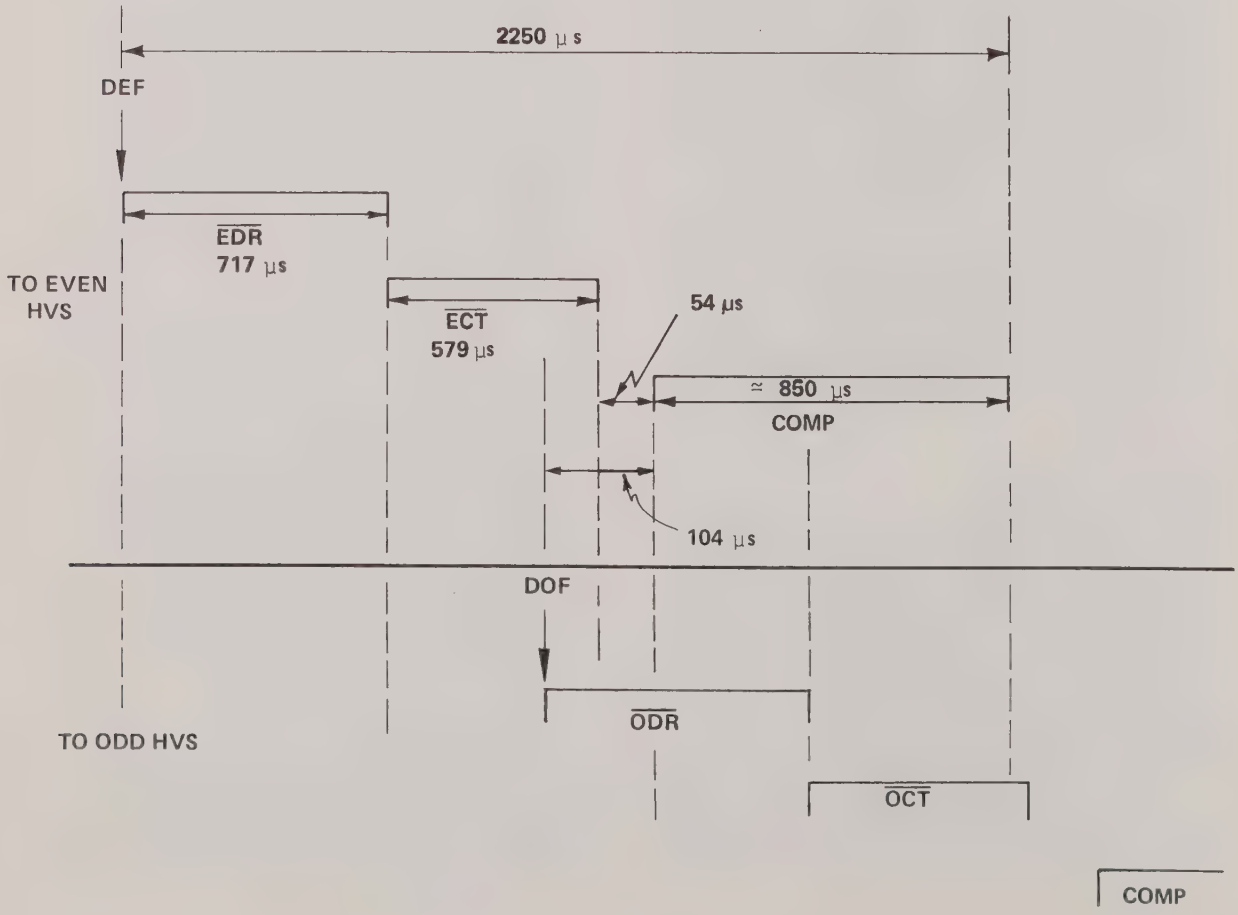


Figure 4-16. Low Speed Detect Circuit Waveform

and commutate signals are of fixed pulse duration. If the print belt slows down, it will take more time before the EDR or ODR signals will be sent. The total time to ground up to 30 even or odd solenoids, drive the hammers and turn off the HVS switches is 2250 us. It is during COMP time that coils are being grounded. Drive time causes hard copy printing and commutate time turns off all hammer solenoids previously turned on.

Hit Limit Counter

For each coil being grounded, an FH pulse is sent from the FOH-FEH GEN circuit. This pulse when sensed at the HIT LIMIT 30 COUNTER will cause the counter to increment upwards one count. The DF signal will reset the counter. If the count ever reaches the maximum of 30 or 8 (depending upon Printer model), the output signal HLIM will be sent to the FIRE CKT to inhibit the generation of any more FIRE signals until the counter resets on the next DF pulse. This process will assure that no more than 30 or 8 (depending upon Printer model) hammer solenoids will be driven simultaneously. This will prevent drawing more than the rated current from the +109V power supply.

If the +109V power supply drops significantly below its rated voltage, the signal HVL from the PSR board will cause HLIM to be sent prohibiting hammer solenoids from being grounded. The same process will hold true if COMP is false, ML (from the MOTOR CONTROL LOGIC) is false or if the Printer is feeding paper (FDG is true). Straps J3 and J2 are factory straps which are used to set the maximum count for the HIT LIMIT 30 COUNTER.

Rate Limit Counter

The RATE LIMIT ÷ 64 DOWN COUNT circuit is activated by placing a strap on the LMB board. This will cause the signal RTCL to release the DOWN COUNT OUTPUT. For every sixty-four T32 timing pulses, the DOWN COUNT will pulse once. With nothing being printed the UP/DOWN COUNTER 896 will be at zero. As printing starts to occur, FH pulses will count the UP/DOWN COUNTER upwards. For some printing formats, it is possible to print at a printing speed which is in excess of the rated print speed of the Printer. The UP/DOWN COUNTER 896 will average the counts (up and down) over 5 to 10 print lines. If the counter reaches the number 896, the signal GTD (governing time delay) will be sent to the NULL DETECT circuit. This will cause a delay in sending PC even though the ONE LINE MEMORY is empty. The effect is to limit the average rate to:

510 CPS for model 340
400 CPS for model 330
255 CPS for model 320
200 CPS for model 310

MOTOR CONTROL AND ALARM LOGIC (FIGURE 4-15)

When the MOTOR ON pushbutton is pressed on the control panel or when the INT responds to a "motor-on" command from the data source, the signal MONX will cause the signal MTD to be generated from the MOTOR CONTROL LOGIC. This will reset the ALARM LOGIC. The momentary MTD pulse will also cause the signals MTRL, MTRR, MTR and ML to be generated. The MTRL signal will be sent to the control panel to light the MOTOR-ON LED. The MTRR signal will cause the motor relay to energize on XPS and the motor will start. The MTR signal will be sent to the INT board.

Motor Control

When the MOTOR OFF pushbutton is pressed on the control panel, or when INT responds to a "motor off" command from the data source, the signal MOFX will reset the MTR, MTRL, and MTRR signals. The motor will turn off and the MOTOR ON LED on the control panel will turn off. The MOTOR CONTROL LOGIC will also reset if the ALRM signal is sent. The ML output will be sent to the HIT LIMIT 30 COUNTER when MTD is true (motor just starting) or when the motor is off (MTR is true) or when the ALRM signal is true.

Alarm Logic

When the FLTX signal (FLTX = LOW PAPER or +109 VDC is crowbarred) arrives at the ALARM LOGIC, the signals ALRM and ALML are sent to INT and the control panel respectively. This will cause the INT board to indicate the alarm status to the data source and the control panel to indicate the condition to the operator by lighting the ALARM LED. When any of the PSR low voltages are below their rated value, LV will come true turning on the ALRM and ALML outputs. The ALRM signal will also be sent to the MOTOR CONTROL LOGIC.

When a slow speed on the print belt is detected, the LOSP signal will also cause the ALARM LOGIC to set. Finally, when CLP comes true after LFS has turned off at the CLP GEN (figure 4-15), and the LFG signal has not turned off, an ALARM output will result.

PRINTER MAIN TIMING (FIGURE 4-15)

The Printer timing signals are derived initially from a 3.2 Mhz crystal clock oscillator which divides the frequency by 4 (800 KHz) and then develops the phase 1 and phase 2 clock frequencies. The phase 1 and phase 2 clocks will go to all LOG board LSI chips. The two clock outputs are fused (F1 and F2). If either fuse opens, a fault circuit will be triggered. This will cause a board mounted LED to illuminate. The oscillator will also send out the FS (fire strobe) signal at phase 2 time. Finally, X TIME pulses from the phase 1, phase 2 x-timer will be sent to the TSR GENERATOR.

TSR Generator

The TSR GENERATOR circuit will output double pulses continuously in the print cycle. It will output single pulses for each character in the load cycle. The INXO input will cause TSR to double pulse in the print cycle such that odd-stored characters will be at the COMPARE circuit at odd compare time and even-stored characters will be at the COMPARE circuit at even compare time.

T-Time Clock

Finally, the T-TIME CLOCK will output a series of T-timing pulses most important of which are T32 and T64. All timing signals are shown in Figure 4-17.

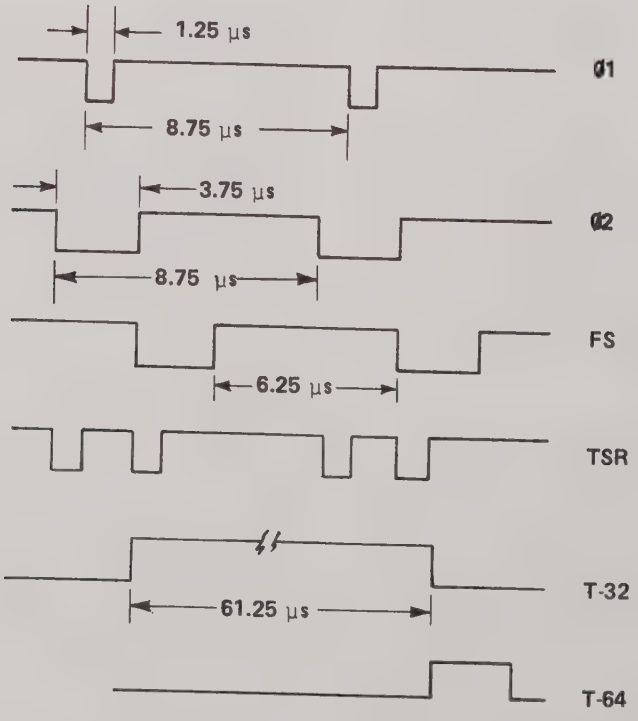


Figure 4-17. Timing Signal Waveforms

POWER CONTROL BOARD (XPS) 44B418210

FUNCTION

The XPS board (Figure 4-18) receives power from the 117V AC power source and, through the power transformer located on the main frame, supplies low voltage, unregulated power to the Printer. In addition, the XPS board contains all power supply fuses, the AC line filter, motor circuit, and linefeed solenoid driver.

The XPS/2 (earlier version illustrated) contained the AC line filter components. This board has been replaced by the XPS/3 board used on later model Line Printers. The XPS/4 board, containing improved filtering, replaces XPS/3, however XPS/3 should not be used to replace XPS/4. Printers using XPS/3/4 contain the AC line filter in the AC switch box on top of the electronics bustle inside the pedestal.

FUSES

F1—4A MDA — 157V Supply
F2—5A MDX — 10V Supply
F3—2A MDX — +25V Supply
F4—2A MDX — -25V Supply
F5—7A MDX — Input Power

CAUTION

For optimum protection against short time heavy overloads, F5 must be the type of 7A MDX fuse having a single, heavy strap to the element instead of two small wires (see Table 5-5).

STRAPS

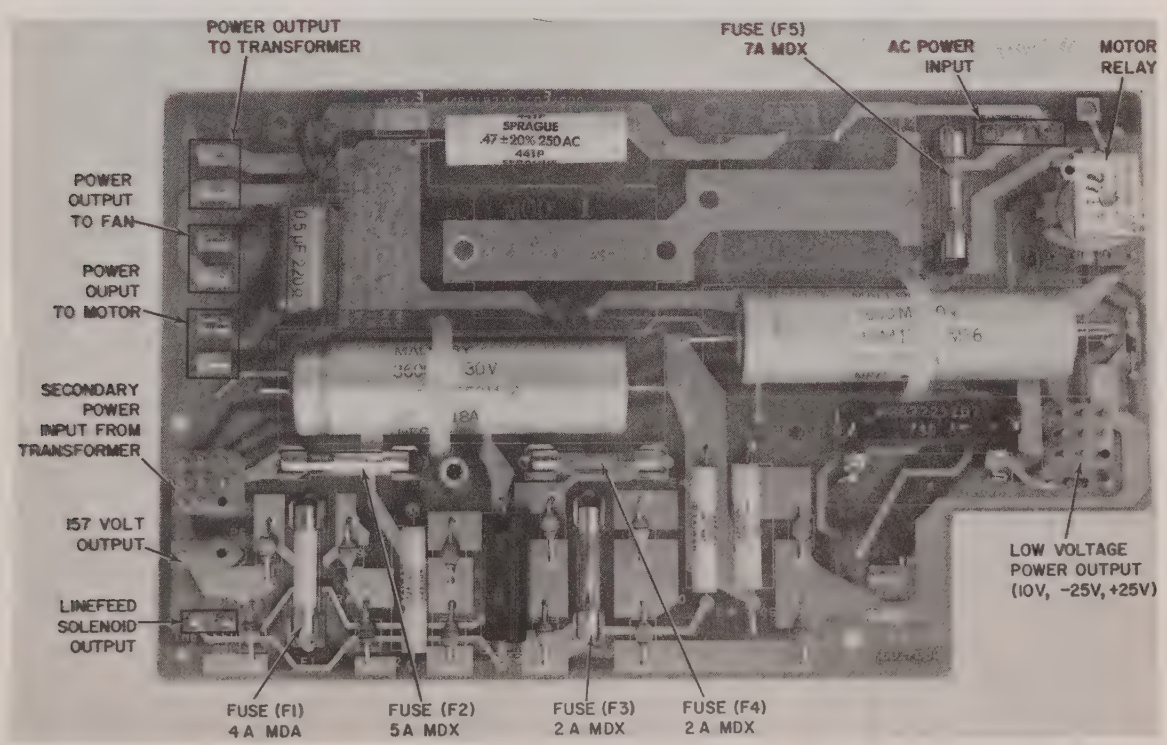
None

TEST POINTS AND WAVEFORMS

None

PRINCIPLES OF OPERATION

Power enters the Printer via the power cord and goes through the cover interlock switch and power switch located on the right rear of the Printer. Both of these switches must be closed before power exists on the XPS board.



PLH 7038

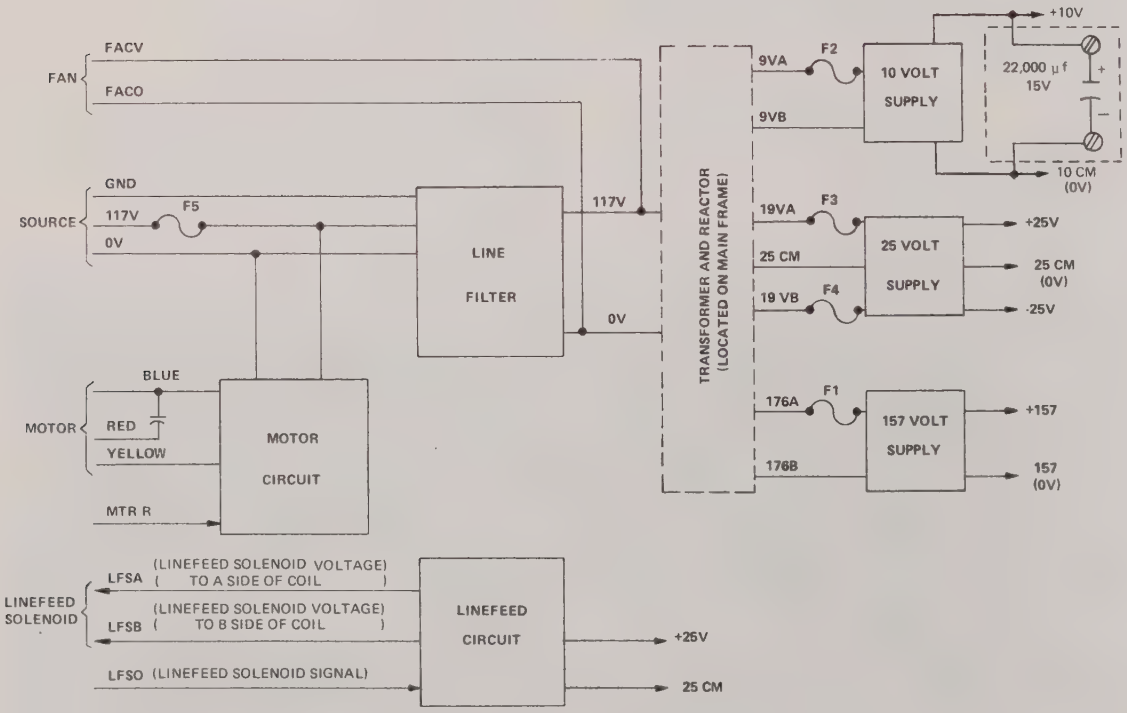
Figure 4-18. Power Control Board (XPS)

The incoming AC power passes through the line filter inside the AC switch box (later models). The line filter prevents line-generated RFI from entering the power supplies and also prevents unit-generated RFI from conducting back into the AC line. The fuse F5 protects the 117V AC primary circuit. (See Figure 4-19).

The XPS board also contains the motor circuits. The Printer motor is fed from the line side of the RFI filter. The motor circuit includes the motor relay and associated circuitry to reduce voltage transients generated by the relay contacts. Thermal overload protection is internal to the motor.

The 157 volt power supply provides power to the +109 volt regulator found on the Power Supply Regulator board (PSR). Fuse F1 provides protection against failure of the +109 volt regulator.

The low voltage power supplies provide unregulated low voltage power to the low voltage regulators on the PSR board. The +25 volt, -25 volt, and 10 volt unregulated power supplies the +15 volt, -15 volt, and +5 volt regulators respectively. In addition, -25 volt unregulated power is also used to supply the -12 volt regulator.



PLL-5063

Figure 4-19. Power Control Board Circuit Diagram

INTERFACE BOARD (INT/2) 44C417522

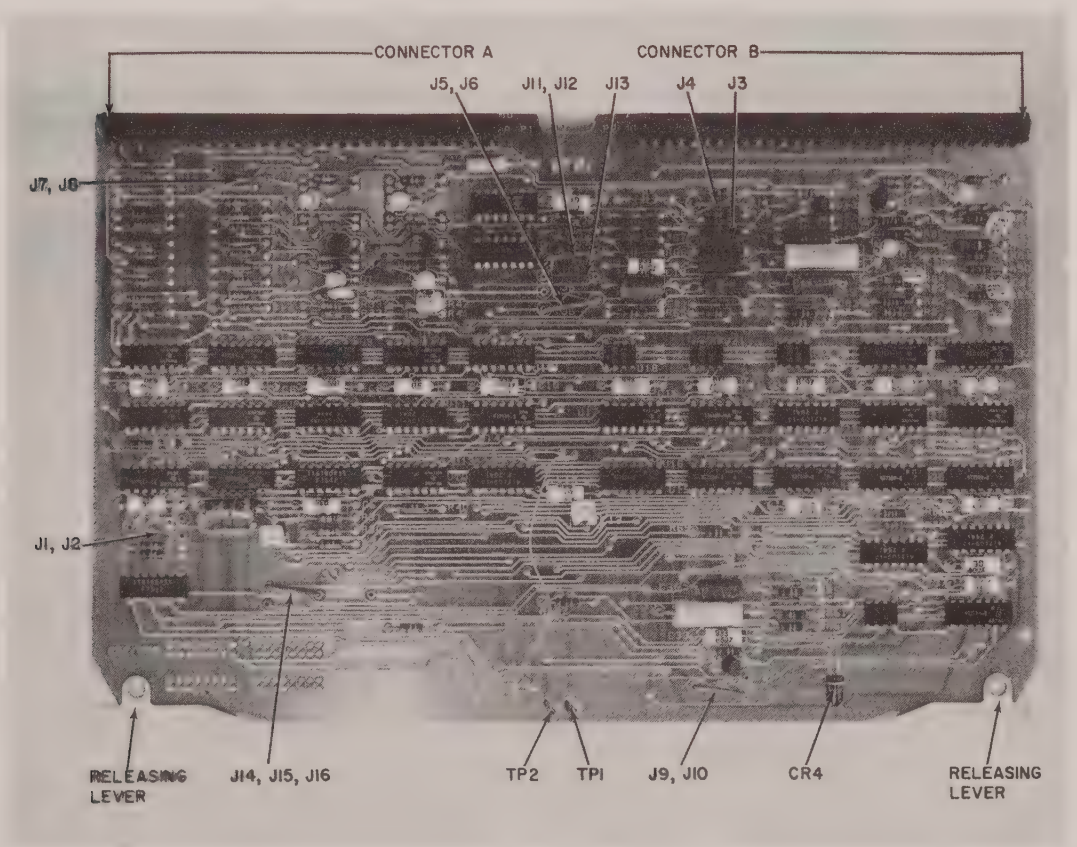
NOTE

Many special interfaces are available for TermiNet 310/320/330/340 Line Printers. Information on these interfaces is included in separate manuals (see page ii).

FUNCTION

The Interface board (INT) (Figure 4-20) used in the TermiNet Line Printer interfaces the Printer with the data source (central computer system, communications buffer, or other intelligent data system device). Because of this, INT boards will differ depending upon the specific hardware or software requirements of the system in which the Printer is employed. For specific information on a particular system interface, refer to the separate INT board documentation for that system. However, there are many functions which will be identical and common to all INT boards. Therefore, even though the following information describes the INT/2 board, much of it is also applicable to other interfaces.

The INT/2 board receives all data and control signals through a 25-pin connector. It contains logic to perform a parity check. The board also contains decode circuitry to execute paper control commands, i.e, line feed, vertical tabulation, form feed, or slew. Finally, the INT/2 board contains interface logic for other control commands and status signals such as bell and low paper.



PLH 7037

Figure 4-20. Interface Board (INT)

FUSES

None

STRAPS

J1 In, J2 Out	Check for Even Parity.
J1 Out, J2 In	Check for Odd Parity.
*J1 Out, J2 Out	Do not check for Parity
J3 In, J4 Out	M+F signal high for paper motion.
*J3 Out, J4 In	M+F signal high for Motor On.
J5 In, J6 Out	No response to Form Feed, Vertical Tab, or Vertical Slew commands.
*J5 Out, J6 In	Normal Response to Vertical Format Codes.
J7 In, J8 Out	Input Data Strobe is positive going
*J7 Out, J8 In	Input Data Strobe is negative going
J9 In, J10 Out	READY is high when Printer cannot receive data.
*J9 Out, J10 In	READY is low when Printer cannot receive data.
*J11 In, J12 Out	Delete Code ignored.
J11 Out, J12 In	Delete and Underline Codes ignored (used with 64 character subset option).
J13 In	No character printed when Parity Error detected.
*J13 Out	◊ printed when Parity Error detected.
J14 In, J15 Out	PER signal reset by print action.
J16 Out	VFU code parity error not responded to.
*J14 Out, J16 In,	PER signal reset by print action.
J15 Out	VFU code parity error does set PER signal.
J14 Out, J16 Out, J15 In	PER signal reset by next character received without a parity error.

*Standard strapping configuration.

TEST POINTS

TP1 and TP2--When shorting TP1 and TP2 together, the test generator will be activated and the motor will turn on.

PRINCIPLES OF OPERATION

In typical applications, the 25 pin data connector on the Printer will have those signals as shown in Table 4-1 below.

TABLE 4-1
INTERFACE SIGNALS

PIN NO.	SIGNAL NAME	TO PRINTER	TO DATA SOURCE
1	Frame Ground (FRAME)		X
2	Data Bit 2 (D2)	X	
3	Data Bit 3 (D3)	X	
6	Ready to Printer (RTP)	X	
7	Signal Ground (0V)		X
8	Data Bit 4 (D4)	X	
9	Interrupt (INT)		X
10	Here Is (ANS)		X
11	Data Bit 1 (D1)	X	
12	Data Bit 6 (D6)	X	
13	Character Acknowledge (ACK)		X
14	Data Bit 7 (D7)	X	
15	Fault		X
16	Data Bit 8 (D8)	X	
17	Paper In Motion (M+F)		X
18	Data Bit 5 (D5)	X	
20	Printer Ready (RFP)		X
21	Parity Error (PER)		X
22	Bell (BEL)	X	
23	Data Transfer (TRAN)	X	
24	Data Strobe (STB)	X	
25	Low Paper (LPFP)		X

Note - Pins 4, 5, and 19 not used.

The Printer will receive one full line of data at the maximum transfer rate of 60,000 characters/sec. After the full line of data has been received by the LOG board from the INT board, the LOG board will send a busy signal to the data source via the INT board. During this busy time, the Printer will execute any paper feeding commands received via the first character received in the line of data, print the line of data, and execute a linefeed. While the linefeed is being executed, another line of data may be entered from the data source.

The actual data will enter the data line driver on the INT board in parallel form over the eight lines $\overline{D1}$ - $\overline{D8}$. The data will be sent from the data line driver to the parity error detect circuit and the decode circuit as $\overline{D1}$ - $\overline{D8}$. Additionally, the data will go to the LOG Board, as $\overline{DB1}$ - $\overline{DB7}$.

If a character is received having a parity error, the parity generator will generate the PER signal which is used to inform the data source of the erroneous character. Depending on the strapping arrangement selected, the PER signal can be reset in any one of the following ways:

1. When print action is initiated. A parity error in the paper control code will cause the code to be ignored but will not generate a PER signal.

2. When print action is initiated. A parity error in the paper control code will cause PER to be generated.

3. When the next character is received without a parity error. This arrangement permits the data source to immediately retransmit characters received in error to create a correct printed copy.

Another strapping option will cause a parity error to either be ignored by the Printer, or to cause the data line driver to force the output lines $\overline{DB1}$ - $\overline{DB7}$ (going to LOG) to an "ON" condition. This will in turn cause the parity error symbol "◇" to be printed.

The parallel data $\overline{D1}$ - $\overline{D8}$ will be sent to the decode circuit as well as to the parity error detect circuit.

The first character in each line of data is concerned with controlling paper movement; however, if the motor is off, the first character may also be used to initiate the motor on sequence. The decode circuits are enabled for only the first character by the first character enable signal (FC). Along with each character, a strobe signal is received from the data source. A strapping option is provided to allow either a negative or a positive going data strobe. The data strobe passes through a 2 μs delay circuit and fires a 5 usec one shot. This 5 usec signal is called DS. Assuming that the first character is a valid paper moving code, the decode circuit will output the appropriate paper movement command (LF, FF, VT, or slew) to the Printer. A strapping option is provided to disable the special VT and FF codes and the slew option which will cause the VT and FF or FF and LF code to result in a line feed only. A series of gating circuits are used so that only the appropriate decoded signal will cause the desired paper action to occur. The First Character (FC) signal is also sensed by the slew gate along with $\overline{D7}$. If D7 is a logic 1 (for the first character), the Slew Strobe (SSTB) will turn on. During First Character time, the Data Strobe to buffer (DSTB) which is used to clock data on lines $\overline{DB1}$-$\overline{DB7}$, is inhibited. Also, DSTB will be inhibited anytime D6 and D7 are both a logic 0 (control character). This means that no control codes or paper control codes are able to enter the Printer memory. Whenever the first character is a paper slew command ($\overline{DB7}$ = logic 0), the Slew Strobe (SSTB) will be sent to the LOG board so that $\overline{DB1}$ through $\overline{DB6}$ of that character can be clocked into the slew counter. This in turn will determine how many lines (up to 63) of paper will be slewed. A strapping option is provided which cause Delete codes to be ignored. Also, when the 64 character subset option is used, a strapping option is available to cause Delete and Underline codes to be ignored.

CONTROLS

The INT board contains several control circuits to control Printer action from the data source or to inform the data source of certain Printer actions. These circuits will vary depending on which system and corresponding INT board is used. Therefore, the following control circuits discussed will be as used only on the INT/2 board.

TRANSFER (XFR) AND READY FROM PRINTER (RFP)

The Transfer signal (XFR) is derived from the TRAN signal (pin 23) which is sent to the Printer from the data source. The XFR signal, in turn, enables the Ready From Printer (RFP) signal (pin 20) provided that the alarm, low voltage, or test conditions do not exist. A strapping option is available to make RFP either high or low when the Printer cannot receive data. The RFP signal is used to inform the data source that the Printer is ready for data. The RFP signal

is used to light the READY LED indicator on the INT/2 board. The RFP signal will cause the data source to begin transferring data to the Printer. When a full line of data has been clocked into the Printer memory, the signal $\overline{FC}$ derived from Full Count (FCNT) will turn off XFR which will in turn cause RFP to turn off. This will cause the data source to go busy until the Previous line of data has been printed. After the line of data has been printed, the signal IPC which is derived from Print Complete (PC) will enable XFR and RFP which will again signal the data source to start transferring more data. When the data source has less than a full line of data to send, the data source will send the signal TRAN following the last character in the data line. This will turn off SFR and RFP causing the received data to be printed.

Motor On

The motor will automatically turn on upon receipt of data or TRAN signal from the data source, or can be turned on manually with the pushbutton switch on the control panel. Since the paper control character may be received by the Printer when the motor is off, this character may be used to initiate the motor on sequence. MON signals from the interface are ignored.

Motor Off

The motor will turn off approximately 1 minute after the last printing action occurs, or manually with the pushbutton switch on the control panel. MOF signals from the interface are ignored.

Bell Signal (BEL)

The Printer bell will sound upon receipt of a signal on the BEL input line (pin 22) of longer than 2 μs in duration.

For multiple bell ringing, the pulses from the data source must be at least 500 ms apart.

Ready to Printer (RTP)

When the RTP lead (pin 6) from the interface to the Printer is a logic 1, the READY indicator on the Printer control panel will light.

Interrupt (INT)

The signal INT (pin 9) will be sent to the data source when the INTERRUPT pushbutton is pressed on the Printer control panel.

Answerback (ANS)

The signal ANS (pin 10) is sent to the data source when the HERE IS pushbutton is pressed on the Printer control panel.

Low Paper (LPFP)

The signal LPFP (pin 25) is sent to the data source when the low paper switch on the Printer senses the absence of paper.

Acknowledge (ACK)

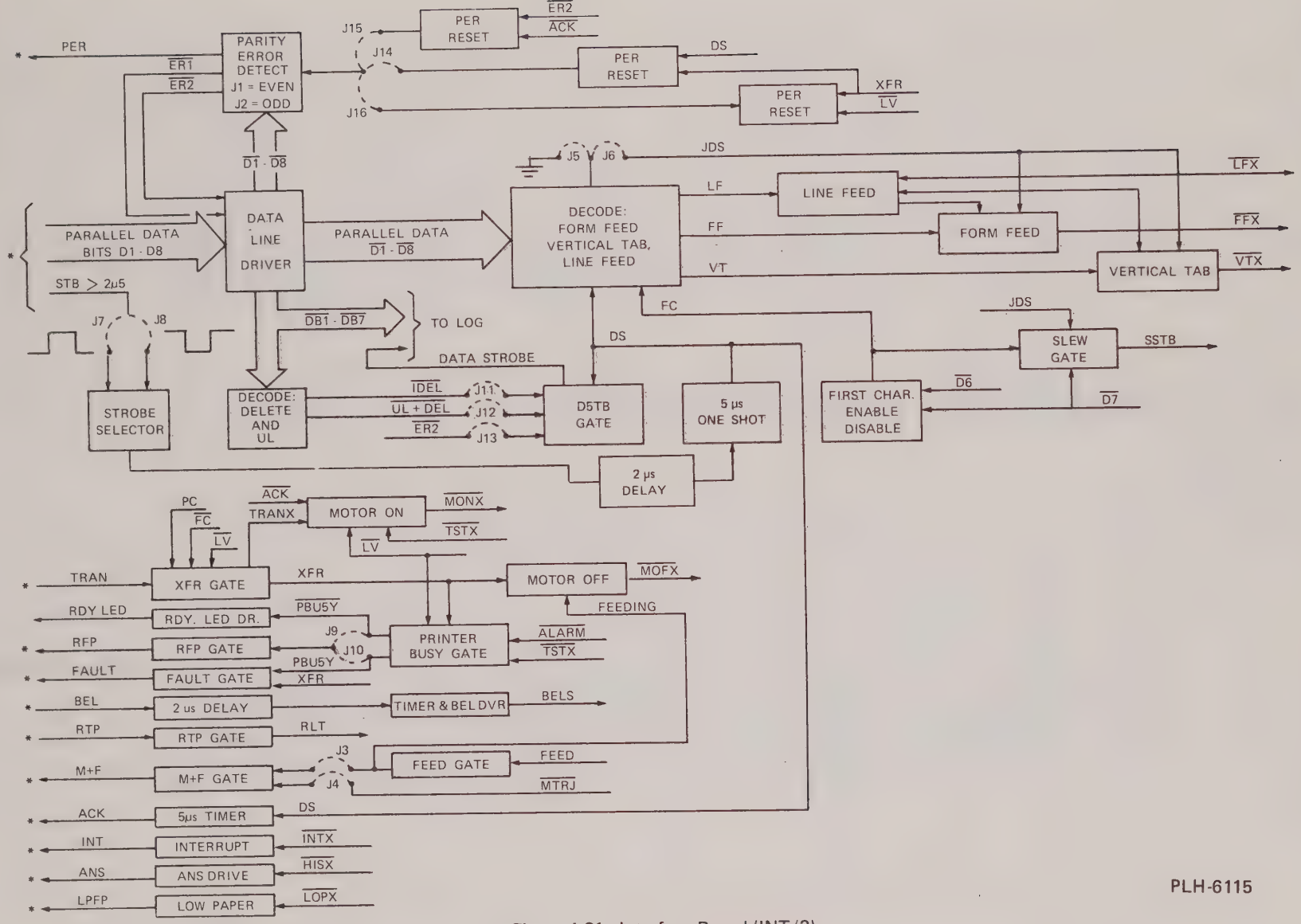
The signal ACK (pin 13) is sent to the data source after each character has been received by the Printer logic board. This signal will limit data transfer to one character every 14 to 20 μs. A maximum data transfer rate of 60,000 cps is possible when the ACK signal is not used.

Motor or Feeding (M + F)

Motor or Feeding (M + F) signal (pin 17) is used to signal the data source on the status of the Printer. Depending on the strapping arrangement used on the INT/2 board, the data source can be informed through M + F lead when paper is in motion or when the motor is off.

Fault

A fault signal (pin 15) is generated and sent to the data source when an alarm condition exists, or Printer voltage is too low.



PLH-6115

Figure 4-21. Interface Board (INT/2)

* Denotes Interface Signal

SECTION 4

GLOSSARY

The following glossary contains a list of most of the commonly used signal names and their definitions used in the TermiNet 340 Line Printer.

ACK	Acknowledge
ALML	Complement of Alarm Light
ALRM	Complement of Alarm
ANS	Answerback
BEL	Bell
BELS	Complement of Bell Signal
CBAR	Crowbar
D1-D8	Data Lines 1 through 8
DB1-DB7	Complement of Data Bits 1 through 7
DSTB	Data Strobe
ECT	Even Commutate
EDR	Even Drive
EF	Even Finger
EHD	Even Hammer Drive
ELED	Even LED
EVNF	Even Finger
FCNT	Full Count
FCOM	Phototransistor Common
FEED	Paper Feed Signal
FEH	Fire Even Hammers
FFPC	Formfeed Photocell
FFX	Complement of Formfeed Signal
FLTX	Complement of Fault Signal
FOH	Fire Odd Hammers
FRAME	Frame Ground
GND	Ground (Chassis)
HISX	Complement of Here Is Signal
HVL	High Voltage Low
HZ	Column Decoding Z Line
H0	Column Decoding 0 Line
H2	Column Decoding 2 Line
H4	Column Decoding 4 Line
H6	Column Decoding 6 Line
H8	Column Decoding 8 Line
H10	Column Decoding 10 Line
H12	Column Decoding 12 Line
H14	Column Decoding 14 Line
H16	Column Decoding 16 Line
H32	Column Decoding 32 Line
H48	Column Decoding 48 Line
H64	Column Decoding 64 Line
H80	Column Decoding 80 Line
H96	Column Decoding 96 Line
H112	Column Decoding 112 Line
H128	Column Decoding 128 Line
INT	Interrupt
INTX	Complement of Interrupt P.B.
LEDC	LED Common
LFSO	Linefeed Solenoid
LFX	Complement of Linefeed P.B.
LOPX	Complement of Low Paper Switch
LPFP	Low Paper from Printer
LTP	Ready Lamp
LV	Low Voltage
LVS	Low Voltage Signal for HVS
M+F	Motor or Paper Feed
MOF	Motor Off
MOFX	Complement of Motor Off P.B.
MON	Motor On
MONX	Complement of Motor On P.B.
MTR	Complement of Motor Signal
MTRL	Complement of Motor Light
MTRR	Complement of Motor Relay
OCT	Odd Commutate
ODDF	Odd Photocell
ODR	Odd Drive
OF	Odd Finger
OHD	Odd Hammer Drive
OLED	Odd LED
OSC	Oscillator Output
PC	Photocell
PER	Parity Error
PON	Power On
RFP	Ready from Printer
RLT	Complement of Ready Light
RTP	Ready to Printer
SOL1-SOL132	Solenoid Coil Connection for Print Position 1 through 132
SPKP	Sprocket Pulse
SPR1-SPR4	Spare #1 through Spare #4
SSTB	Slew Strobe
STB	Strobe
TRAN	Transfer
TSTX	Complement of Test P.B.
VTPC	Vertical Tab Photocell
VTX	Complement of Vertical Tab P.B.
XFR	Complement of Transfer Signal
Z	Zener Diode Paralleling Connection
0V	Signal Ground

CHAPTER 5
MAINTENANCE
SECTION 1
PREVENTIVE

GENERAL

Preventive maintenance consists mainly of visual inspection, cleaning, and lubrication. If a problem is discovered and the cause is not obvious, refer to the TROUBLESHOOTING section of this Chapter. If the cause of the problem has been determined, refer to PARTS REMOVAL AND ADJUSTMENT section of this Chapter to install a new component or to make an adjustment.

It is suggested that the instructions in this section be performed every six months or 1000 motor on hours whichever occurs first (unless otherwise noted). It may be necessary for the serviceman to modify Preventive maintenance instructions to suit extreme variations of use and environment of the printer.

VISUAL INSPECTION

Raise the cover and check the printer as follows:

1. Inspect belts, pulleys and gears for wear. An accumulation of dust under the pulleys or line feed clutch is an indication of excessive wear of a pulley, clutch, or a drive belt.

2. Check for loose or missing parts.

3. Check for bent or broken print fingers.

4. Check for frayed or folded ribbon.

5. While holding the motor pulley stationary, move the print belt back and forth and check for excessive play (movement of the print belt more than one finger width) in the system. Too much play indicates a loose pulley or drive belt.

6. Rotate print belt and check for freedom of movement.

7. Check for loose connections and frayed wiring.

ADJUSTMENT CHECKS

Check all adjustments in Table 5-4. If adjustment is needed, refer to Section 3 of this Chapter for procedure.

OPERATION CHECKS

Perform the checkout procedure in Chapter 2.

CLEANING AND LUBRICATION

WARNING

DISCONNECT POWER BEFORE CLEANING

EXTERNAL CLEANING

Clean the top and bottom covers, pedestal, and control panel with a soft cloth dampened in a mild, non-abrasive detergent solution. Stubborn stains, oil, and ink smudges can be removed with a soft cloth dampened in alcohol.

INTERNAL CLEANING

Photocell cleaning must be done during each preventive maintenance period and when printing errors occur. A buildup of paper dust or condensed moisture will impair the effectiveness of the photocell and cause erroneous printing. To clean the photocell and adjacent areas, remove the ribbon cartridge. Blow away paper dust on top of the photocell block on both sides of the print belt. Use a small squeeze ball air blower of the type commonly used for cleaning camera lenses, or as found in desoldering kits. If condensation is heavy, first wipe the damp area with a clean, soft, lint-free cloth, then blow the area dry. If condensation reforms, warm the printer to 60°F or more and again clean the photocell. Warm exhaust air from a vacuum cleaner may also be used for cleaning and drying.

If necessary, the platen should be cleaned with alcohol to remove ink accumulations.

CAUTION

DO NOT APPLY ALCOHOL OR ANY OTHER CLEANING AGENT TO AN OILITE* BEARING.

Accumulations of dirt inside the printer can be removed with a cloth dampened in alcohol or blown out with dry compressed air (if available).

*Registered trademark of Chrysler Corp./Amplex Div.

PLH-6105

Figure 5-1. Cleaning Type Fingers

Type fingers can be cleaned by using a type cleaning brush backed by a sponge or soft cloth. (See Figure 5-1.)

Keep the inside of the print belt clean by wiping with a dry cloth or blowing with dry compressed air (if available). Care should be exercised not to damage or deposit dirt on the rebound belt.

LUBRICATION

1. When cleaning parts before lubrication, do not use alcohol or any other cleaning agent on OILITE bearings.

2. For average environmental conditions, the lubrication instructions in Table 5-3 should be performed every six months or 1000 motor-on hours whichever occurs first unless noted otherwise. If environment is extremely dirty, the lubrication instructions should be followed more often as circumstances warrant.

NOTE

The two recommended lubricants are:

Oil SAE 10W-20W-40 non detergent motor oil (Shell X100 or equivalent non-detergent type).

Grease Lubriplate* #630-AAME-D6A3

*Registered trademark of Fiske Brothers Refining Company

BUTTON-UP

The preventive maintenance procedure should be completed by performing the following:

INSPECTION

1. Wires must not touch any moving parts.

2. Check for blown fuses on the XPS board and secure power supply cover.

3. All sub-assembly hardware must be secure, especially the following:

a. Hammer and Print Belt Assembly

b. Motor

c. Pulleys

d. Platen

e. Interlock Switch

f. Rebound Bar

g. Belt Guides

h. Photoelectric Sensor

i. Forms Tractor Assembly

4. Make sure no loose hardware or other foreign matter is inside the printer, and that all retaining rings are in place on pulleys, shafts, etc.

5. Check platen movement to make sure it turns freely.

6. Check that the forms tractors rotate easily when the platen advance knob is rotated counterclockwise. It should not be possible to rotate them in the clockwise direction.

7. Make sure the paper handling system is adjusted so the paper feeds freely and does not skew. (See Chapter 3 — OPERATION for paper handling procedures.)

8. Check to see that the print belt rotates freely in the counterclockwise direction when moved by hand.

TOOLS AND TEST EQUIPMENT

The test equipment recommended for checking outputs on PWB test points is a dual trace oscilloscope. Scope syncing should be done internally from observed test points.

Special tools helpful in servicing the Family of TermiNet 340 Line Printers are listed in Table 5-1. A listing of suggested standard tools for servicing the printer appears in Table 5-2.

TABLE 5-1
SPECIAL TOOLS AND LUBRICANTS

PART NUMBER	ITEM	PURPOSE
44A410619-G01	Timing Gauge	To set correct timing of hammer fire for correct print out.
44A410588-G01	Bearing Puller Tool	Removal of jackshaft bearings.
44A410583-001	Pulley Height Gauge	Setting correct vertical height of shimmed print belt pulleys (to match belt guides)
44B412269-001	Finger Removal Pliers	For extracting and replacing print belt print fingers without damaging type head.
44A417371-001	Lubricant	Lubricating the print belt.
44A410695-G01	Graphite Solution	Replacing worn graphite coating on print belt.
44A418630-003	Manual Tape Punch and Splicer	
– – – –	Shell X-100 SAE 10w-20w-40 Motor Oil	Lubricating Printer locations in Table 5-3.
– – – –	Lubriplate #630-AAME-D6A3 Grease	Lubricating Printer locations in Table 5-3.
– – – –	Moly Dag 200 Lubricant	Lubricating upper clevis pins.

TABLE 5-2
SUGGESTED STANDARD TOOLS

(1/8 in. x 8 in.) Flat Blade Screwdriver	(Xcelite R188)
(5/32 in. x 4 in.) Flat Blade Screwdriver	(Xcelite R5324)
*(3/16 in. x 8 in.) Flat Blade Screwdriver	(Xcelite R3164)
(1/4 in. x 6 in.) Flat Blade Screwdriver	(Xcelite R146)
(5/16 in. x 8 in.) Flat Blade Screwdriver	(Xcelite R5168)
*Stubby Flat Blade (1/4 in. x 1 in.) Screwdriver	(Xcelite S141)
*Flat Blade Offset Screwdriver (#6, #10)	(VACO VO-2)
*Screw Launcher (3/16 in. x 6 in.)	(VACO K-36)
*6 in. Adjustable Wrench (3/4 in. Jaws)	(Diamalloy D76)
*1/4 in. Regular Nut Driver	(Xcelite HS8)
7/16 in. Regular Nut Driver	(Xcelite HS14)
Extra Long Magnetic Nut Driver (1/4 in. x 10 in.)	(Xcelite A8M)
5/16 in. Combination Wrench	
.050 in. Across Flat Hex Key	
1/16 in. Across Flat Hex Key	
5/64 in. Across Flat Hex Key	
9/64 in. Across Flat Hex Key	
5/32 in. Across Flat Hex Key	
*Drift pin (1/16 in. Dia.)	
*Needle Nose Pliers	(Xcelite 56CG)
Diagonal Pliers	(Xcelite 55CG)
Long Nose Pliers	(Xcelite 41CG)
Knife	(X-ACTO #2)
*Replacement Knife Blades	(X-ACTO #25)
Feeler Gauges (0.0015 in. to 0.025 in.)	(K-D Tools, Lancaster, Pa. K-D No. 161)
*8 oz. Belt Tension Gauge	(Teletype #110443)
15 Watt Soldering Iron	(Ungar Princess #6903)
*15 Watt Soldering Element	(Ungar #6915)
*Soldering Tip	(Ungar #6961)
*Soldering Aid	(Hunter #51)

*Optional

TABLE 5-2 (SUGGESTED STANDARD TOOLS) Continued

Desoldering Tool	(Soldapullt D5017)
60/40 Resin Core Solder	
*Heat Sink	(Hunter No. 51G)
*Tip Cleaning Sponge and Stand for Holding Iron	
Wire Strippers (#30 AWG – #12 AWG)	
Utility Push-Pull Gauge	(Chatillon Catalog No. LP15. John Chatillon & Sons, 83-30 Kew Gardens Road, New Gardens, New York 11415)

*Optional

TABLE 5-3
LUBRICATION

LUBRICATION POINT	METHOD
Left Idler Pulleys (Figure 5-2)	- Idler Pulleys containing Oilite Bearings—apply two drops of oil on shaft adjacent to bearing. - Idler Pulleys without Oilite Bearings—Remove pulley, wipe shaft clean and lightly coat shaft with grease.
Left Jackshaft Bearing (Figure 5-2)	- Apply two drops of oil between pulley and side frame.
Right Jackshaft Bearing (Figure 5-4)	- Apply two drops of oil on shaft adjacent to end of bearing on outside of side frame.
Line Feed Clutch (Figure 5-5)	- Apply two drops of oil between the clutch cam and stop collar (see Figure 5-5).
Platen Bushings (Figures 5-3 and 5-4)	- Apply two drops of oil to shaft at end of bushing on each end of platen.
Platen Drive Gears (Figure 5-5)	- Remove platen. - Remove any dried grease and dirt from gears. - Lightly coat gear teeth with grease. - Reinstall platen.
Forms Tractor Drive Gear (Figure 5-5)	- Remove any dried grease and dirt from gear. - Lightly coat gear teeth with grease.
Line Feed Idler Gear (Figure 5-3)	- Remove idler gear. - Wipe inside clean and check for scoring. If steel sleeve is scored, replace the idler gear. - Wipe gearshaft clean and coat with grease. - Reinstall idler gear.
Ribbon Drive Mechanism (Figure 5-3)	- Remove ribbon cartridge. - Clean any dirt or dried grease from gears with a small brush or swab. - Rotate print belt so all areas of gears can be cleaned. - Apply two drops of oil on drive shaft just above gear clutch assembly (Figs. 5-30 and 5-31). - Lightly coat all gear teeth with grease. - Lift up bottom of drive spring and apply two drops of oil on drive shaft just above bushing. - Reinstall ribbon cartridge.

TABLE 5-3 (LUBRICATION) continued

Friction Brake (Figure 5-19)	- Apply one drop of oil to each end of hub. The friction brake is located at the left end of the paper handler tractor.
Print Belt (Figure 5-4)	- Remove print belt. - Thoroughly clean belt with a dry cloth or dry fiber brush. Use no chemicals. - Coat belt surface with graphite (anti-static) solution (G. E. Part Number 44A410695-G01) using small, bristle paint brush. Also coat the cracks between the fingers and belt. - Reinstall print belt. - Turn Printer motor on. - With print belt running, spray the inside of belt with lubricant near right print belt pulley directed at guide rib for 1-2 seconds. Use MS122 Aerosol Dry Lubricant (G. E. Part Number 44A417371-001).
Motor (Perform every 12 months or 2000 motor-on hours).	- Remove cosmetic shield. - Remove platen. - Apply two drops of oil in the oil hole on both ends of motor. - Reinstall cosmetic shield and platen.

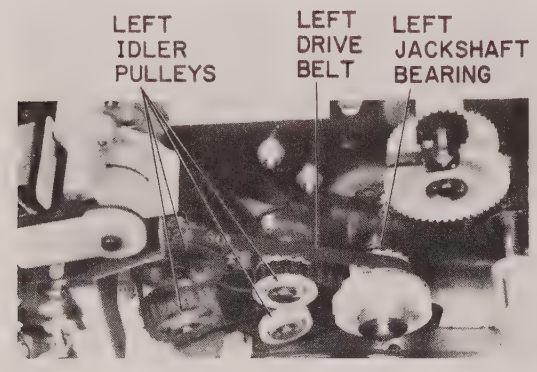


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Figure 5-2. Left Idler Pulleys and Jackshaft Bearing

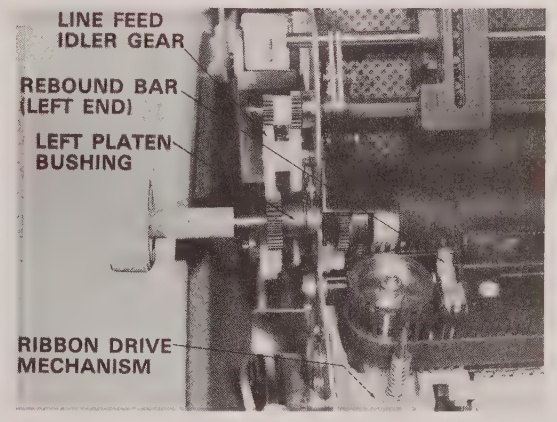

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Figure 5-3. Lubrication and Adjustment Points—Left Side

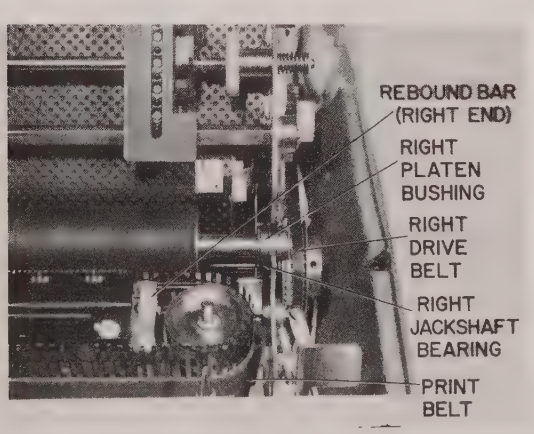

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Figure 5-4. Lubrication and Adjustment Points—Right Side

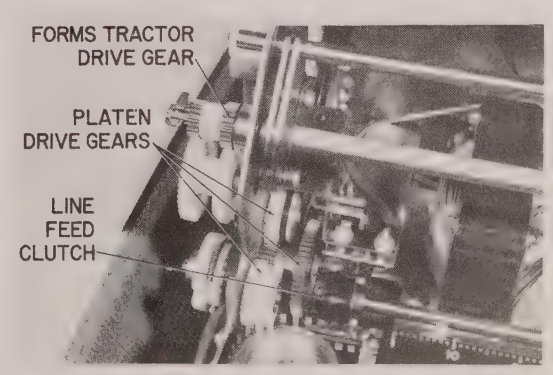

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Figure 5-5. Lubrication Points—Left Side

TABLE 5-4
ADJUSTMENTS

PART	ADJUSTMENT LOCATION	SPECIFICATION	PAGE LOCATION OF PROCEDURE
Left and Right Drive Belts	Deflection of belt with 4 oz. (114 g) of applied pressure applied to mid-span of belt.	0.10-0.30 in. (2.5-7.6 mm) – Left. 0.05-0.225 in. (1.3-5.7 mm)–Right.	5-49 5-62
Jackshaft	End play - left side.	0.003-0.008 in. (0.08-0.20 mm).	5-63
Jackshaft	Right end of jackshaft to outside surface of pulley.	Flush to 0.06 in. (1.5 mm).	5-63
Line Feed Solenoid	Between Solenoid Arm and highest Clutch lobe. (Highest point on lobe, and arm in energized position).	0.005-0.010 in. (0.13-0.25 mm).	5-65
*Rebound Bar (See note below)	Between crowned outside edge of print belt pulleys and rear surface of rebound bar – (Right pulley in normal running position.)	0.031 in. (0.79 mm)	5-56
Rear Magnetic Print Belt Guide	Between crowned outside edge of print belt pulleys and rear surface of belt guide. (Right pulley in normal running position.) Height adjustable with 0.005" shims.	0.039 ± 0.003 in. (1.0 ± 0.08 mm).	5-54
Front Print Belt Guide	Between guide and print belt.	0.050-0.070 in. (1.3-1.8 mm).	5-54
VFU Drive Belt	Deflection of belt at mid-point with 2 oz. (57 g) of applied pressure.	0.07-0.13 in. (1.8-3.3 mm).	– – –
Photoelectric Assembly	Initial setting. Position of elongated hole in photoelectric housing with respect to the vertical mounting screw.	Centered.	5-62

*REBOUND BAR ADJUSTMENT IS VERY CRITICAL.
DO NOT ADJUST UNLESS ABSOLUTELY NECESSARY.

NOTE

The latest style rebound bar (44B502239) which has a bow in the center, requires no adjustment or no shims.

SECTION 2
TROUBLESHOOTING

MECHANICAL

Mechanical problems in the printer causing excessive noise or binding can be isolated to the left or the right drive train. The procedure is to slip the left drive belt off the left drive pulley, and turn the printer on.

NOTE

With left drive belt remove, printer runs approximately 1-1½ seconds. Therefore, it may be necessary to restart the motor several times in rapid succession to adequately check for noise.

If the noise or binding condition still exists, the problem must be one of the following:

- Motor
- Right jackshaft bearing
- Left jackshaft bearing
- Linefeed clutch
- VFU mechanism (if installed)

If the noise or binding condition goes away when the printer is turned on, without the left drive belt in place, the problem must be one of the following:

- Left idler pulleys
- Print belt pulleys
- Print belt
- Ribbon drive

ELECTRICAL

FUSES

Table 5-5 lists fuses used in the TermiNet 340 Line Printer Family along with their part numbers, locations, and circuits they protect.

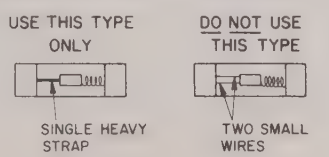
TABLE 5-5

FUSES

FUSE	LOCATION	PART NUMBER	CIRCUIT
4A MDA	XPS (F1)	44A418092-002	+157V
5A MDX	XPS (F2)	K9774741-P15	+10V
2A MDX	XPS (F3)	K9774741-P22	+25V
2A MDX	XPS (F4)	K9774741-P22	-25V
** 7A MDX	XPS (F5)	K9774741-P26	117V
1/8A PICO	LOG (F1)	44A417087-001	PHASE 1 CLOCK
1/8A PICO	LOG (F2)	44A417087-001	PHASE 2 CLOCK
*10A MDA	Pedestal	44A418092-007	250V INPUT

*Used in optional multiple voltage power supply.

**Replacement fuses must be of the single strap type (illustrated below).



STRAPPING OPTIONS

Several straps are available to change options on the TermiNet 340 Family of Line Printers. These wire straps are not soldered, but simply plug into cups located on the associated printed wire boards (PWB's). The functions of the wire straps are given in Table 5-6.

TABLE 5-6
PRINTED WIRE BOARD (PWB) WIRE STRAPS

PWB NAME	STRAP POSITION		FUNCTION
	IN	OUT	
INT/2	J1	J2	Printer checks for even parity.
	J2	J1	Printer checks for odd parity.
		*J1, J2	No parity check.
	J3	J4	Status indication for paper feeding (M+F Signal is high).
	*J4	J3	Status indication for motor (M+F Signal is high).
	J5	J6	Form Feed, Vertical Tab, and Vertical Slew commands are ignored.
	*J6	J5	Printer responds to Vertical Format Codes.
	J7	J8	For positive-going Input Data Strobe.
	*J8	J7	For negative-going Input Data Strobe.
	J9	J10	READY is high when Printer is unable to receive data.
	*J10	J9	READY is low when Printer is unable to receive data.
	*J11	J12	Printer ignores Delete Code.
	J12	J11	Printer ignores Delete and Underline Codes (used with three font belt option using 64 character subsets).
	J13		No character will print when a Parity Error is detected.
		*J13	V will print when a Parity Error is detected.
	J14	J15, J16	Print action will reset PER signal. Printer will ignore Parity Errors in VFU Codes.

Continued

*Standard strapping configuration.

TABLE 5-6
PWB WIRE STRAPS (Continued)

PWB NAME	STRAP POSITION		FUNCTION
	IN	OUT	
INT/2 (cont.)	*J16	J14, J15	Print action will reset PER signal. Parity Errors in VFU Codes will set PER signal.
	J15	J14, J16	PER Signal (once set) is reset by next character received without a Parity Error.
HVS/3/5	*J2	*J1 & *J3	Hit Limit 8.
HVS/4/6	*J1	*J2 & *J3	Hit Limit 30.**
LMB/2		J1	Used on early models with INT/1. May be replaced by LMB/4.
LMB/3			Special Use.
	J1		Model 320 applications.
		J1	Model 340 applications. May be replaced by LMB/6.
LMB/4		J1	Designed as standard Mother Board for Printers using parallel interface boards INT/1, INT/2, HINT/1, and CINT/1. May be used to replace LMB/2.
LMB/5		J1	Used in early Printers with serial interface boards (HINT or CINT with SAUX).
LMB/6			Special Use. May replace LMB/3.
	J1, J2	J3, J4	Model 310 applications.
	J1, J2	J3, J4	Model 320 applications.
	J2	J1, J3, J4	Model 330 applications.
	J3, J4	J1, J2	Model 340 applications.
LMB/8			Universal Line Printer Mother Board. May be used for serial interface applications (CINT or HINT with SAUX) or for parallel interface applications by using cable assembly 44B419199-G01 instead of the SAUX board in the AUX bustle slot. Strapping configuration is identical to LMB/6.
LMB/9			Special Use. For bustle w/o bell. Strapping configuration is same as on LMB/6.

Continued

*Standard strapping configuration

**Strapping configuration not available on TermiNet 340 Printers manufactured after November 1, 1979.

TABLE 5-6
PWB WIRE STRAPS (Continued)

PWB NAME	STRAP POSITION IN	STRAP POSITION OUT	FUNCTION
LMB/10			Special Use. For bustle with bell. Strapping configuration is same as on LMB/6.
LMB/11			Same as LMB/8 except .125A, 125V fuse added Strapping configuration is same as on LMB/6.
LMB/12-14			For special application only.
LMB/15			Not available.
LMB/16			New universal Mother Board replaces LMB/8, 10 and 15.
	J1, J2, J5	J3, J4	For Model 310.
	J1, J2	J3, J4, J5	For Model 320.
	J2, J5	J1, J3, J4	For Model 330.
	J3, J4	J1, J2, J5	For Model 340.
			CAUTION PRINTER MAY BE DAMAGED IF LMB IS INSTALLED IN A PRINTER OF LOWER MODEL THAN LMB IS STRAPPED FOR. SOLDER STRAPS J1-J5 WHEN INSTALLING.
LOG/1,2,3, 4,5,6,7	J4 to 80		80 Print Column operation.
	J4 to 120		120 Print Column operation.
	*J4 to 132		132 Print Column operation.
LOG/8		J2, J3	510 CPS Rate (1)
	J3	J2	408 CPS Rate (2)
	J2	J3	255 CPS Rate (3)
	J2, J3		204 CPS Rate (4)
			CAUTION WHEN REPLACING A LOG/1-7 WITH A LOG/8, J2 AND J3 MUST BE SET FOR A RATE COMPATIBLE WITH PRINTER MODEL BEING USED. FAILURE TO OBSERVE THIS CAUTION MAY RESULT IN PRINTER DAMAGE.
	J4 to 80		80 Print Column operation.
	J4 to 120		120 Print Column operation.
	*J4 to 132		132 Print Column operation.

*Standard strapping configuration **Can be replaced by HQMB PWB.
NOTE—LMB straps are soldered in board.

(1) For TermiNet 340 Line Printer
(2) For TermiNet 330 Line Printer
(3) For TermiNet 320 Line Printer
(4) For TermiNet 310 Line Printer

SELF TEST

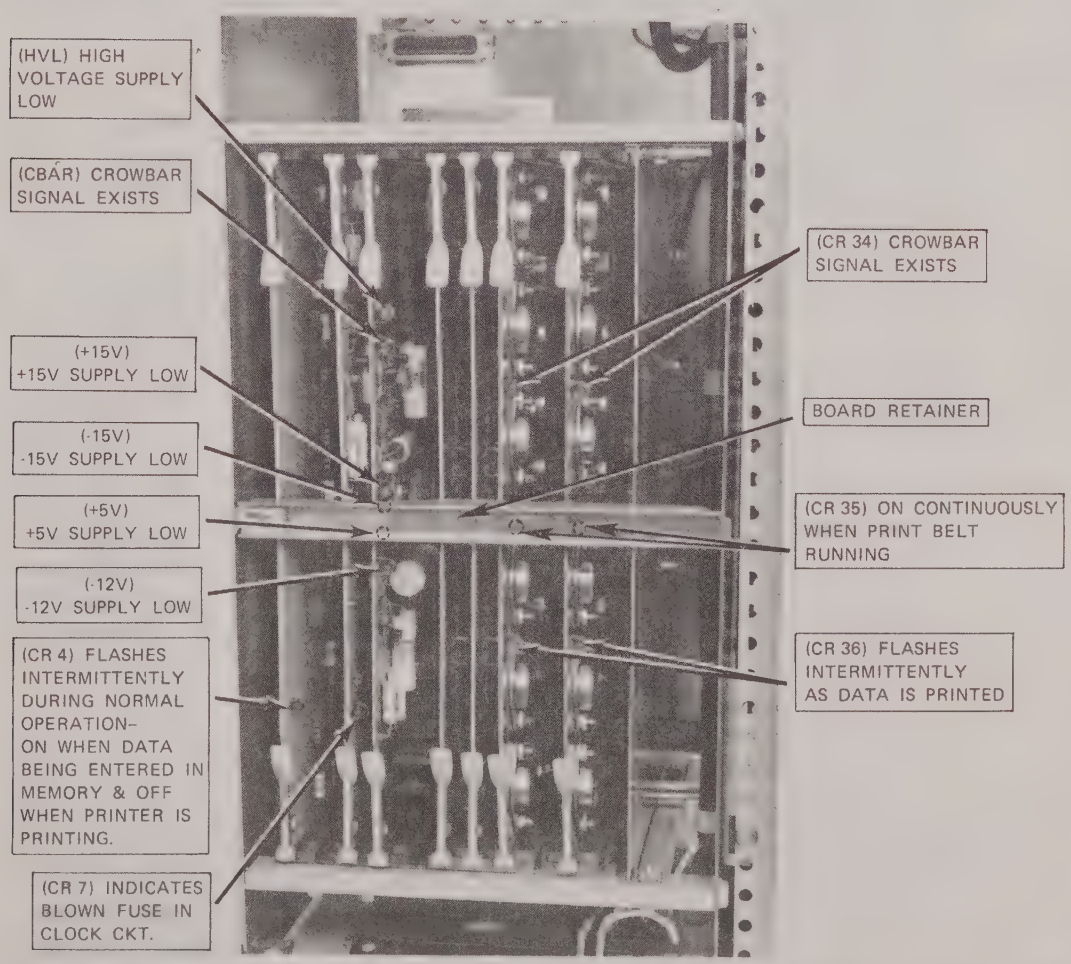
Troubleshooting (electrical) the TermiNet 340 Family of Line Printers should begin by utilizing the self test features built into the printer. The self test provides for a rapid checkout of printer action. The staggered test pattern will print continuously as long as the TEST pushbutton (certain models only) on the control panel is held in. If results cannot be obtained from the self test, refer to the following description of the PWB status indicators and the troubleshooting guide at the end of this section.

NOTE

Some models using a special interface board have the self test switch on that board.

STATUS INDICATORS (Figure 5-6)

To facilitate troubleshooting, the Line Printer contains light emitting diode (LED) status indicators located on the outside edges of four different printed wire boards. The status indicators can be readily viewed from the front of the pedestal when the pedestal cover and board retainer is removed. Figure 5-6 shows the locations of the indicators along with an explanation of which conditions exist when they are illuminated.


(HVL) HIGH VOLTAGE SUPPLY LOW
(CBAR) CROWBAR SIGNAL EXISTS
(+15V) +15V SUPPLY LOW
(-15V) -15V SUPPLY LOW
(+5V) +5V SUPPLY LOW
(-12V) -12V SUPPLY LOW
(CR 4) FLASHES INTERMITTENTLY DURING NORMAL OPERATION– ON WHEN DATA BEING ENTERED IN MEMORY & OFF WHEN PRINTER IS PRINTING.
(CR 7) INDICATES BLOWN FUSE IN CLOCK CKT.
(CR 34) CROWBAR SIGNAL EXISTS
BOARD RETAINER
(CR 35) ON CONTINUOUSLY WHEN PRINT BELT RUNNING
(CR 36) FLASHES INTERMITTENTLY AS DATA IS PRINTED

PLH-6108

Figure 5-6. Status Indicators

Table 5-7 should provide some assistance in quickly identifying a defective PWB or other problem by examining the condition of the PWB Status Indicators and/or ALARM indicator. No attempt has been made, however, to cover every possible fault condition that could occur. Those items listed under "Possible Cause" in Table 5-7 are given as suggestions only for a starting point in troubleshooting the Printer. If the fault can not be readily identified by using the LED Indicators, consult the "Troubleshooting Guide" at the end of this Section for additional suggested problem areas.

TABLE 5-7
TROUBLESHOOTING WITH LED INDICATORS

CONDITION	LED INDICATORS (ALARM · CR34/HVS · CR35/HVS · CR36/HVS · HVL/PSR · CBAR/PSR · +15V/PSR · −15V/PSR · +5V/PSR · −12V/PSR · CR7/LOG)	POSSIBLE CAUSE
1.	O O ● ◐ O O O O O O O Printer Running and Printing Normally. READY Indicator On.	No Fault — All Conditions Normal. **WARNING** REMOVE AC POWER FROM PRINTER BEFORE REMOVING ANY PRINTED WIRE BOARDS.
2.	● ● O O O ● O O O O O Motor Off.	LHD* Board. HVS* Board. HINT When condition 2 occurs, remove LHD board from same position (odd or even) where CR34 on HVS is lit. With LHD removed, turn Printer on. If motor continues to run, CR34 goes out, and CR35 comes on, the removed LHD board is probably faulty. However, if CR34 lights, the HVS board containing the lighted CR34 is probably faulty PSR Board. Print Belt Photodetector. LOG Board. Shorted Hammerbank Coil.
3.	O O O ◐ O O O O O O O or O ● O O O ● O O O O O Motor Runs — No Printing In ODD or EVEN Positions.	HVS* LHD* HINT When condition 3 occurs, interchange the two HVS boards. If print omission has changed from even to odd (or vice versa), replace HVS board for columns not printing (even or odd). If print omission does not change, replace the LHD board for columns not printing.

*EVEN or ODD position LHD or HVS faulty depending upon which HVS has CR34 lit.

Continued

TABLE 5-7
TROUBLESHOOTING WITH LED INDICATORS
(Continued)

CONDITION	LED INDICATORS ALARM CR34/HVS CR35/HVS CR36/HVS HVL/PSR CBAR/PSR +15V/PSR −15V/PSR +5V/PSR −12V/PSR CR7/LOG	POSSIBLE CAUSE
4.	● O O O O O O O O O O Motor Off.	Out of Paper. Top Cover not closed tight. Low Belt Speed caused by Mechanical Binding. LOG Board. Print Belt Photodetector.
5.	O O ● O O O O O O O ● Motor Runs — No Printing.	Fuse F1/F2 Blown on LOG Board. LOG Board.
6.	● ● O O O ● O O O O O (any one) Motor Off. or O O O O O O O O O O ●	XPS Board (Low Voltage Supply Low). LOG Board. LMB Board.
7.	O ● ● O ● ● O O O O O Motor Runs — No Printing	PSR Board (High Voltage Supply Low). XPS Board. Blown Fuse (F1). Shorted Capacitor (Top of Bustle).
8.	● O O O O ● O O O O O Motor Off.	PSR Board.
9.	● ● O O O ● ● O O O O Motor Off.	PSR Board. XPS Board. Blown Fuse (F3).
10.	● ● O O O ● O ● O ● O Motor Off.	PSR Board. XPS Board. Blown Fuse (F4).
11.	● ● O O O ● O O ● O O Motor Off — Power OFF Indicator Out.	PSR Board. XPS Board. 15000 µf. Capacitor (C11) opens up or Wire Leads Disconnected. Blown Fuse (F2).
12.	O O O O O O O O O O O Motor Off — All Indicators Off — Fans Running.	Blown Fuse (F5). Interlock Switch.

(Continued)

TABLE 5-7
TROUBLESHOOTING WITH LED INDICATORS
(Continued)

CONDITION	LED INDICATORS ALARM CR34/HVS CR35/HVS CR36/HVS HVL/PSR CBAR/PSR +15V/PSR −15V/PSR +5V/PSR −12V/PSR CR7/LOG	POSSIBLE CAUSE
13.	O O O O O O O O O O O Motor Off – All Indicators Off – Fans Off.	Fuse Blown on Auto Transformer (International Models) in Pedestal.
14.	O O ● ◐ O O O O O O O Printer Running – No READY Indicator	Bad Connection to Data Source. Interface Board.
	LEGEND O LED not illuminated. ● LED illuminated. ◐ LED flashes on and off.	

TROUBLESHOOTING GUIDE

If a preliminary examination of the status indicators does not immediately reveal the cause of a problem, the following guide should be used as a further aid in troubleshooting the printer.

Before using the Troubleshooting Guide, determine what the problem is and determine what functions are operating correctly. Find the problem description in the center of the guide that best describes your problem. Under the problem description, find the condition in the left hand column of the guide that best describes the conditions related with your problem. In the right hand column, across from the appropriate condition, you will find a possible cause to your problem.

TROUBLESHOOTING GUIDE

NOTE: Conditions listed in this Guide correspond to various LED indications listed in Table 5-6, TROUBLESHOOTING with the LED indicators. The Possible Causes listed in this Guide will help to learn why LED indicators are lighted.

CONDITIONS	POSSIBLE CAUSE
PRINTER WILL NOT TURN ON	
No Lamps, Motor, etc.	1. Printer not plugged into outlet. 2. Primary fuse missing or blown. 3. XPS Board.
Lamps, But No Motor Alarm Light ON	1. Paper-Out switch. 2. Paper Load Switch. 3. Low voltage (AC Input). 4. INT Board. 5. LOG Board.
Lamps, But No Motor Alarm Light Off	1. XPS Board. 2. Pushbutton switch. 3. Starting capacitor - shorted or leads off. 4. Defective motor. 5. Print fingers caught. 6. Hammer caught in fingers.
MOTOR STARTS BUT WILL NOT KEEP RUNNING	
	Electrical
2 - 3 Seconds Only (Primary Fuse May Blow)	1. PSR Board. 2. Loose or broken wire to photocell. 3. HVS Board. 4. Mother Board.
	Mechanical
	1. Right or left drive belt tight. 2. Print finger missing. 3. Print finger bent or catching. 4. Misalignment of pulleys and belt guide. 5. Drive belt off. 6. Print finger not seated in belt. 7. Dust or condensation in photocell. 8. Jackshaft and/or motor pulley loose. 9. Line feed idler gear binding on shaft.
Runs Minutes to Hours	Electrical Static Noise
	1. Open ground lead. 2. Loose or intermittent connection.
	Electrical
	1. PSR Board. 2. Mother Board (LMB). 3. XPS Board.

Continued

CONDITIONS	POSSIBLE CAUSE
MOTOR STARTS BUT WILL NOT KEEP RUNNING (Continued)	
	Mechanical
	1. Print belt dirty. 2. Right or left drive belt tight. 3. No clearance at left jackshaft pulley. 4. Idler pulleys binding on shaft. 5. Misalignment between pulleys and belt guide. 6. Cooling fan. 7. Line feed idler gear binding on shaft.
MOTOR RUNS BUT NO PRINTING OR BAD PRINTING	
No Printing in Some Columns	1. Broken common wire on coil bank. 2. LOG Board (missing FOH or FEH). 3. LHD Board. 4. Broken wire on coil bank (missing one column).
Prints Extra Characters in Some Columns	1. Log Board. 2. INT Board. 3. LHD Board
A Specific Character Does Not Print or is Smudged	1. Bent print finger. 2. Top part of print finger missing.
Prints but Snags Fingers	
• On Particular Character Only	1. Bent print finger. 2. Top part of print finger missing.
• On Particular Column Only	1. Bent clevis. 2. Plunger binding in coil bank. 3. Hammer throw adjustment.
• On Odd or Even Columns	1. LHD Board. 2. HVS Board.
• At Any Column or Character	1. Bent print finger. 2. Photocell Timing. 3. LHD Board. 4. HVS Board. 5. Dust or condensation in Photocell.
Gapping (not associated with a particular column/s)	1. Photocell Defective. 2. PSR Board.
Gapping (associated with a particular column/s)	Worn Clevis and Plunger Assembly.
PRINTS LIGHT ON ONE PART OF CHARACTER	
Light On Top Or Bottom All Columns	1. Hammer bank not seated properly. 2. Magnetic belt guide incorrect height.
Light On Top One Character Only	Finger not seated in belt.
Light On Left	1. Hammer throw adjustment. 2. Bent clevis. 3. Plunger binding in coil bank. 4. PSR Board.

Continued

CONDITIONS	POSSIBLE CAUSE
PRINTS LIGHT ON ONE PART OF CHARACTER (Continued)	
Light On Right	1. Bent print finger. 2. Photocell Timing. 3. PSR Board.
PRINTS LIGHT ON ALL CHARACTERS	
Ribbon Does Not Move	Ribbon cartridge defective.
Ribbon Does Move	Ribbon worn - cartridge needs replacement.
PRINTS DESIRED COLUMN PLUS ADDITIONAL COLUMNS	
	1. LOG Board. 2. LHD Board.
LINE FEED PROBLEMS	
Uneven Line Feeds	1. Obstruction holding paper. 2. Friction brake. 3. Idler gear assembly (6/8 LPI option).
	Electrical
Double Line Feed When Single Called For	LOG Board.
	Mechanical
	1. Line feed solenoid arm too far from clutch. 2. Line feed solenoid defective.
	Electrical
Single Line Feed When Double Called For	LOG Board.
	Mechanical
	1. Line feed solenoid arm too close to clutch. 2. Line feed solenoid pick-up incorrect.
	Mechanical
Continuous Line Feeds When Power is Applied	Line feed solenoid.
	Electrical
No Line Feed	1. LOG Board. 2. Mother Board. 3. XPS Board.
	Electrical
Multiple Line Feeds or Form Feeds When Applicable Pushbutton Is Pushed Once.	1. Pushbutton Switch. 2. LOG Board.

CONDITIONS	POSSIBLE CAUSE
PAPER HANDLING	
Will Not Feed Correctly	See line feed section.
Tracks To One Side	1. Obstruction holding paper. 2. Adjustment of Forms Tractors. 3. Platen not locked at ends.
False Low-Paper Indication (Printers modified for front paper loading).	When used in front paper loading configuration, the front low-paper sensor plug must be plugged into jack under the left front corner of printer (see Figure 5-23). When used in the rear paper loading configuration, the front low-paper sensor plug must be removed from jack under the left front corner of printer (see Figure 5-23).
ON-LINE OPERATION	
Hammer Fires Repeatedly In Column 1	Font tab missing.
Hammer Fires Each Time Finger Passes Photocell	1. LHD Board (shorted SCR). 2. LHD Board (short on PC runs).
Random Hammer Misfire	1. XPS arc suppression defective. 2. Insufficient grounding. 3. LHD Board.
Primary Fuse Blows When Power Applied	1. XPS Board shorted. 2. Wiring shorted from XPS. 3. HVS Board. 4. LHD Board. 5. PSR Board. 6. Transformer.
Blows Primary Fuse at Particular Hammer Position	Shorted coil.
ALARM Indicator Lights	LOG Board.
Power On - ALARM Indicator Lights	LOG Board.
Motor Runs When Power Is Applied	INT Board. XPS Board.
Constant READY Light	INT Board.
Garbled Printing	1. Dust or condensation in Photocell. 2. INT Board. 3. LOG Board.

LHD BOARD – HAMMER COIL CONNECTIONS

Troubleshooting the printer for one or more columns not printing can be facilitated by understanding how connection is made between the Line Hammer Decoder (LHD) boards and the hammer bank coils.

Two identical LHD boards are used in the bustle of the printer—one for the odd slot for controlling the odd hammer coils and one in the even slot for controlling the even hammer coils.

NOTE

A pair of slots is provided in the bustle for the two LHD circuit boards. The slot to the right in this pair is the odd slot while the left slot is the even one.

Each LHD board has two connectors—an A connector at the top, and a B connector at the bottom. These two connectors mate with the two groups of 60 pins each on the mother board—an A group and a B group. The mother board pins extend through the mother board making them also available on the rear side (facing rear of pedestal) of the mother board where the bottom hammer bank connectors are attached. The hammer bank coil wires run up through the bottom of the printer to the top hammer bank connectors located in the front frame of the printer at the rear of the control panel. Figure 5-7 illustrates typical connections for print positions 4 and 60. The connector numbering scheme is also illustrated in Figure 5-7.

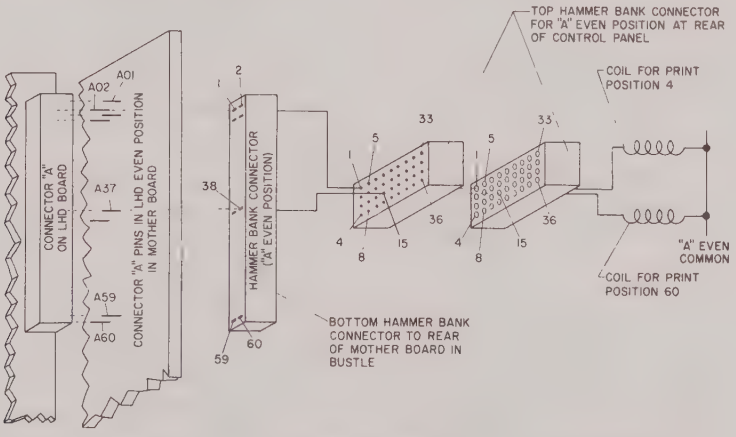


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Figure 5-7. LHD Board to Hammer Coil Connections

The relative positions of the top hammer bank connectors are illustrated below in Figure 5-8. An identifying label is affixed on the bottom of each top hammer bank connector.

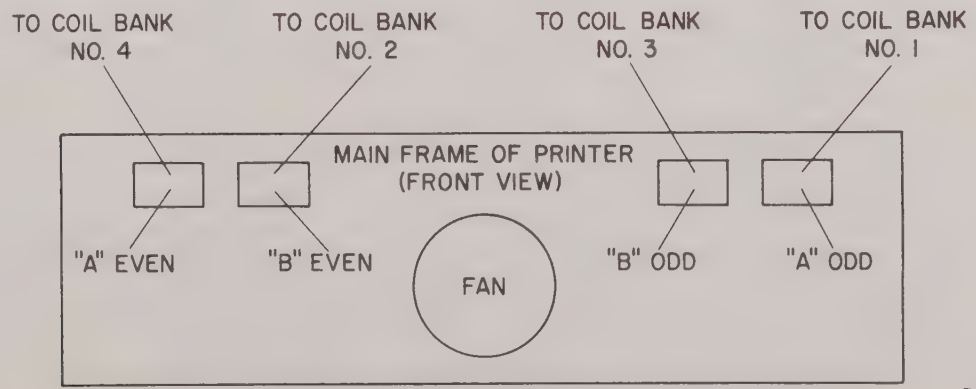

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Figure 5-8. Location of Top Hammer Bank Connectors

Figure 5-9. illustrates the relative positions of the coil bank assemblies in the hammer bank. Each of the four coil banks contains 33 coils to make up a total of 132 coils—one for each print position.

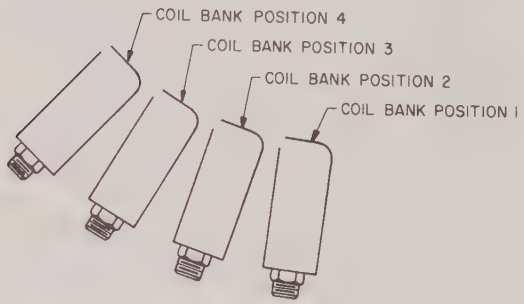

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Figure 5-9. Relative Positions of Coil Bank Assemblies As Viewed from Right End

The following table (Table 5-8) can be used as a handy troubleshooting tool when checking for open or shorted hammer bank coils. Column one in the table corresponds to print positions (or columns) on the printer. Column two gives the terminal numbers in the top hammer bank connector corresponding to the print position in column one. Column three gives the terminal numbers in the bottom hammer bank connector (connector on rear of mother board) corresponding to the print positions in column one. Finally, column four gives the mother board pin numbers corresponding to the print positions in column one. The contact numbers on the LHD boards agree with the pin numbers on the mother board.

NOTE

Terminal numbers in the top hammer bank connector identify the coil positions on the associated coil bank. For example, terminal number 16 in the connector represents the 16th coil (from left to right) in the associated coil bank.

TABLE 5-8
HAMMER COIL TO MOTHER BOARD CONNECTIONS

COIL BANK POS. 1 ("A" ODD)				COIL BANK POS. 2 ("B" EVEN)				COIL BANK POS. 3 ("B" ODD)				COIL BANK POS. 4 ("A" EVEN)			
Print Position	Terminal No. in Top Hammer Bank Connect.	Terminal No. in Bottom Hmr. Bank Connec.	Mother Board Pin No.	Print Position	Terminal No. in Top Hammer Bank Connect.	Terminal No. in Bottom Hmr. Bank Connec.	Mother Board Pin No.	Print Position	Terminal No. in Top Hammer Bank Connect.	Terminal No. in Bottom Hmr. Bank Connec.	Mother Board Pin No.	Print Position	Terminal No. in Top Hammer Bank Connect.	Terminal No. in Bottom Hmr. Bank Connec.	Mother Board Pin No.
1	1	2	A01	2	1	2	B01	3	1	2	B01	4	1	1	A02
5	2	1	A02	6	2	1	B02	7	2	1	B02	8	2	4	A03
9	3	4	A03	10	3	4	B03	11	3	4	B03	12	3	3	A04
13	4	3	A04	14	4	3	B04	15	4	3	B04	16	4	6	A05
17	5	6	A05	18	5	6	B05	19	5	6	B05	20	5	5	A06
21	6	5	A06	22	6	5	B06	23	6	5	B06	24	6	8	A07
25	7	8	A07	26	7	8	B07	27	7	8	B07	28	7	7	A08
29	8	7	A08	30	8	7	B08	31	8	7	B08	32	8	10	A09
33	9	10	A09	34	9	10	B09	35	9	10	B09	36	9	14	A13
37	10	14	A13	38	10	14	B13	39	10	14	B13	40	10	13	A14
41	11	13	A14	42	11	13	B14	43	11	13	B14	44	11	16	A15
45	12	16	A15	46	12	16	B15	47	12	16	B15	48	12	15	A16
49	13	15	A16	50	13	15	B16	51	13	15	B16	52	13	18	A17
53	14	18	A17	54	14	18	B17	55	14	18	B17	56	14	36	A35
57	15	36	A35	58	15	36	B35	59	15	36	B35	60	15	38	A37
61	16	38	A37	62	16	38	B37	63	16	38	B37	64	16	35	A36
65	17	35	A36	66	17	35	B36	67	17	35	B36	68	17	40	A39

Continued

TABLE 5-8 (CONTINUED)
HAMMER COIL TO MOTHER BOARD CONNECTIONS

COIL BANK POS. 1 ("A" ODD)				COIL BANK POS. 2 ("B" EVEN)				COIL BANK POS. 3 ("B" ODD)				COIL BANK POS. 4 ("A" EVEN)			
Print Position	Terminal No. in Top Hammer Bank Connect.	Terminal No. in Bottom Hmr. Bank Connec.	Mother Board Pin No.	Print Position	Terminal No. in Top Hammer Bank Connect.	Terminal No. in Bottom Hmr. Bank Connec.	Mother Board Pin No.	Print Position	Terminal No. in Top Hammer Bank Connect.	Terminal No. in Bottom Hmr. Bank Connec.	Mother Board Pin No.	Print Position	Terminal No. in Top Hammer Bank Connect.	Terminal No. in Bottom Hmr. Bank Connec.	Mother Board Pin No.
59	18	40	A39	70	18	40	B39	71	18	40	B39	72	18	37	A38
73	19	37	A38	74	19	37	B38	75	19	37	B38	76	19	42	A41
77	20	42	A41	78	20	42	B41	79	20	42	B41	80	20	39	A40
81	21	39	A40	82	21	39	B40	83	21	39	B40	84	21	44	A43
85	22	44	A43	86	22	44	B43	87	22	44	B43	88	22	41	A42
89	23	41	A42	90	23	41	B42	91	23	41	B42	92	23	43	A44
93	24	43	A44	94	24	43	B44	95	24	43	B44	96	24	47	A48
97	25	47	A48	98	25	47	B48	99	25	47	B48	100	25	50	A49
101	26	50	A49	102	26	50	B49	103	26	50	B49	104	26	49	A50
105	27	49	A50	106	27	49	B50	107	27	49	B50	108	27	51	A52
109	28	51	A52	110	28	51	B52	111	28	51	B52	112	28	56	A55
113	29	56	A55	114	29	56	B55	115	29	56	B55	116	29	55	A56
117	30	55	A56	118	30	55	B56	119	30	55	B56	120	30	58	A57
121	31	58	A57	122	31	58	B57	123	31	58	B57	124	31	57	A58
125	32	57	A58	126	32	57	B58	127	32	57	B58	128	32	60	A59
129	33	60	A59	130	33	59	B60	131	33	59	B60	132	33	59	A60

VFU TO MOTHER BOARD CONNECTIONS

The Vertical Format Unit (VFU) on certain models has an attached cable that is long enough to extend all the way to the VFU connector on the rear of the mother board. Later model VFU assemblies contain a shorter cable that connects onto an extension cable that in turn connects to the mother board. Figure 5-10 and TABLE 5-9 below illustrate how the connections are made.

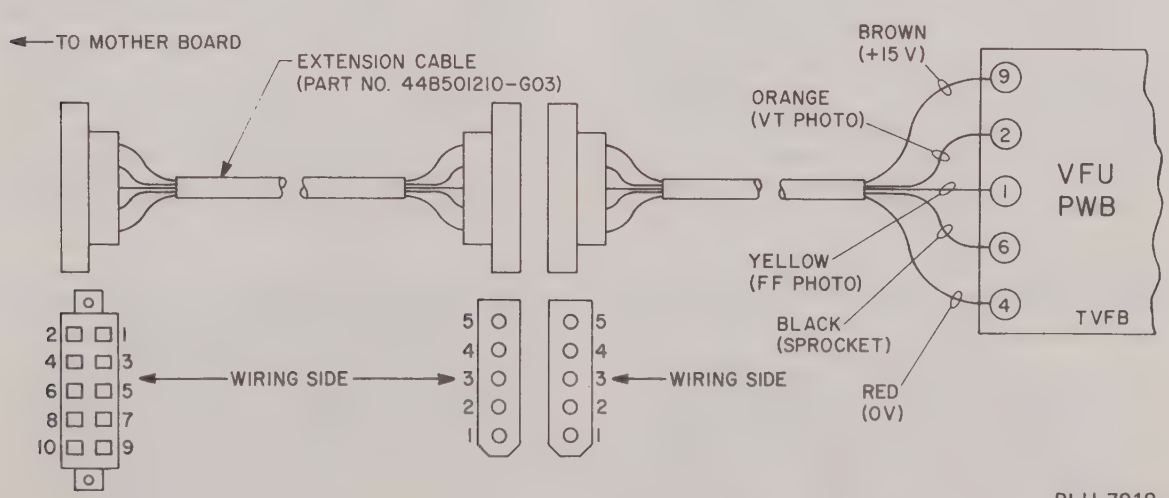

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Figure 5-10. VFU To Mother Board Connections

TABLE 5-9
VFU TO MOTHER BOARD CONNECTIONS

VFU SIGNAL	WIRE COLOR	VFU PWB TERM. #	IN-LINE CONN. TERM. #	MOTHER BD. CONN. TERM. #
+15V	BROWN	9	2	8
VT PHOTO	ORANGE	2	1	10
FF PHOTO	YELLOW	1	5	9
SPROCKET	BLACK	6	4	7
OV	RED	4	3	5
DRAIN	SHIELD	–	–	6

LHD PRINTED WIRE BOARD (PWB) TROUBLESHOOTING

INTRODUCTION

Field service of the LHD circuit board can be carried out by authorized service personnel. Failures can be quickly recognized as occurring on the LHD circuit board or on the LOG circuit board. To quickly recognize the failure area, you must understand the individual hammer solenoid circuit operation coupled with groups of circuits functioning together. With this knowledge, a test printout can furnish an identification of the failed circuit.

NO PRINT IN ALTERNATE PRINT POSITIONS

This failure is most easily identified as either all even column print positions are blank, or all odd column print positions are blank. In either case, the alternate column positions contain a printed character.

The most logical failure is that either FOH or FEH is not being generated by the LOG PWB. Other causes could be that the signal line on the affected LHD PWB is broken after the control signal entered the B54 pin connection on the LHD PWB. The affected control signal could have become grounded to 0 volts. Any of these causes will generate the same failure identification pattern.

A secondary failure can be that the controlling HVS PWB cannot generate the required bus voltage for all even or all odd circuits.

A BLOCK OF 16 PRINT POSITIONS MISSING

The printed sheet contains printed characters in all columns except a continuous group of print positions in column 1 - 15 or 16 - 31 or 32 - 47 or 48 - 63 or 64 - 79 or 80 - 95 or 96 - 111 or 112 - 120 or 121 - 132. Since only 16 print positions do not print, the affected function can be readily identified as one of the incremented-by-16 hammer drive signals. The signal is easily identified by observing which column is missing first. As an example, if print positions 96 - 111 are missing, then the hammer drive signal, H96, must be at fault.

The most logical cause of this failure is that the affected signal cannot be switched from -12 volts by the LOG PWB. Since there are no operating voltages (-15 volts) applied to the LHD PWB, it is illogical to assume that the failure occurred directly on the LHD PWB. This failure is also recognized as affecting both LHD/ODD and LHD/EVEN PWB's.

A BLOCK OF TWO PRINT POSITIONS MISSING FROM EVERY BLOCK OF SIXTEEN

The printed sheet contains printing in every print position except two in the first group of print position 1 - 15 (except position 1, which could have failed). In the fifteenth print position from last missing print, two more positions are missing, with this pattern following across the printed sheet. As an example, if print positions 2 and 3 are missing, with positions 18 and 19, 34 and 35, 50 and 51, 66 and 67, 82 and 83, 98 and 99, 114 and 115, 130 and 131, also missing, the described pattern exists. The signal common to these circuits is hammer drive signal $\overline{H2}$.

The most logical cause of this failure is that the affected signal cannot be switched from -12 volts by the LOG PWB. The affected signal in this case will be an incremented-by-2 hammer drive signal, common to each array of 16 circuits. This failure is recognized as affecting both LHD PWB's.

EXCESS PRINTING IN A BLOCK OF 16 PRINT POSITIONS

The printed sheet contains excess overprinting within only one block of 16 print positions, although all other positions print normally. As an example, positions 1 - 15 are illegible because of excessive overprinting, but positions 16 through 132 are printed normally. Since the failure affects both LHD PWB's, it can be identified as an incremented-by-16 hammer drive signal, specifically, the $\overline{H0}$ hammer drive signal.

The most logical cause of this failure is an open from the LOG PWB on an incremented-by-16 hammer drive signal line. When the other arrays of 16 print positions are being enabled by the incremented-by-2 signals, the affected array is enabled sequentially during the enabling of every other array because the incremented-by-16 line no longer holds off the gate circuits after that group has been enabled and fired.

An alternate condition similar to this failure is that every other position within a block of 16 positions overprints. This failure can be reduced to the affected LHD PWB as a possible open after the hammer drive signal was distributed to the LHD PWB. Identification of the LHD PWB can be easily identified by whether the overprint is in even columns or odd columns.

EXCESS PRINTING IN BLOCKS OF TWO EVERY FIFTEEN PRINT POSITIONS

The printed sheet contains overprinting within two print columns in every block of 16 columns, with the overprinting starting 15 print positions from the preceding overprint position. As an example, overprinting occurs in positions 1, 16 and 17, 32 and 33, 48 and 49, 64 and 65, 80 and 81, 96 and 97, 112 and 113, 128 and 129. All other positions print normally. Since the failure affects both LHD PWB's, it can be identified as an incremented-by-2 hammer drive signal, specifically, the $\overline{HZ}$ hammer drive signal.

The most logical cause of this failure is an open from the LOG PWB on an incremented-by-2 hammer drive signal line. When the other print positions within the individual block of 16 are enabled and fired, the affected two positions will also fire so long as the incremented-by-16 hammer drive signal is active. Therefore, there will be eight overprints on each overprinted position, that is, eight even and eight odd firings for the group of 16.

An alternate condition similar to this failure is that every print position within a block of 16 prints correct except one that overprints. Sixteen positions later, another overprint occurs, with this pattern repeating across the printed sheet. This failure can be reduced to the affected LHD PWB as a possible open after the hammer drive signal was distributed to the LHD PWB. Identification of the LHD PWB can easily be made by whether the overprint is in an even or an odd print column where overprinting occurs.

EXCESS PRINTING IN ONE POSITION ON THE PRINT LINE

The printed sheet contains overprinting in one print position, while all other print positions are printed correctly. This failure can be caused by either an incremented-by-16 or an incremented-by-2 open diode or an LHD PWB. When the overprinting occurs in even columns, the LHD/EVEN PWB is at fault. Overprinting in odd columns identifies the PWB as LHD/ODD.

To determine whether the fault is an incremented-by-16 diode or an incremented-by-2 diode, the data input to the Printer must be in the form of a character, then a line feed until all 132 print positions have been printed. When the overprinted position is identified as occurring once for each block of 16 characters printed, the fault is an incremented-by-16 diode. If the overprinting occurs only during the period that printing occurs within the group enabled by an incremented-by-16 command, then the fault is an incremented-by-2 diode.

Examples of these two conditions are that during the print of the first 15 characters, the overprint occurs (if not in the first 15 positions) once. As the next 16 characters are printed, again the overprint occurs in the column at fault. This pattern, when completed, identified the fault as an incremented-by-16 diode. The other print pattern that identifies the fault as an incremented-by-2 diode could be that while printing the first 15 characters, every other time a character is printed out in one column where overprinting is known to occur. All other blocks of 16 positions print correctly.

NO PRINTING IN FOURTEEN POSITIONS ON THE PRINT LINE

The print sheet contains correct printing in all columns, except 14 print positions within a group enabled by an incremented-by-16 signal. Two of the positions within that group print correctly. This identifies the failure as a shorted incremented-by-16 diode.

When the incremented-by-2 hammer drive signal at

the gate wherein the incremented-by-16 diode is shorted is enabled, the -12 volt bias is removed during the period of both the even and odd period. Thus, two positions of 14 will print since the -12 volts is not coupled back onto the incremented-by-16 line during that period. During the remaining period that the affected block of 16 positions should have been enabled, the -12 volts disables the incremented-by-16 line.

NO PRINTING IN TWO POSITIONS IN EVERY GROUP OF SIXTEEN EXCEPT ONE

The print sheet contains correct printing in all positions except that within every group of 16 print positions, two print positions do not print. In one group of 16 print positions, all the print positions print correctly. This identifies the failure as a shorted incremented-by-2 diode.

As explained above for a shorted incremented-by-16 diode, printing occurs within the affected group when the source of the -12 volts bias is removed. Thus, until printout occurs within the faulted group, all groups will have two print positions biased off. Switching on the affected incremented-by-2 signal, while its corresponding incremented-by-16 signal at the affected gate is on, permits printing.

SECTION 3
PARTS REPLACEMENT AND ADJUSTMENTS

WARNING

DISCONNECT ALL POWER FROM THE PRINTER BEFORE REMOVING OR REPLACING ANY PARTS.

INTRODUCTION

The following parts replacement, adjustment, and lubrication instructions apply equally to all models of the TermiNet 340 Line Printer family which includes the 310, 320, and 330 models. Major differences between these various models are electrical, and therefore are, confined mainly to the Logic (LOG) board. Additionally, the TermiNet 310/320/330 Line Printers do not include the front cooling fan, and contain a smaller power transformer plus fewer power supply components.

Table 5-10 lists those parts peculiar to particular models of the TermiNet 340 Line Printer Family.

TABLE 5-10
PARTS INTERCHANGEABILITY

Part Name	Part Number	Models			
		310	320	330	340
Reactor	44A418334-001			X	X
Transformer	44C414623-G02			X	X
Reactor	44A418086-001	X	X		
Transformer	44C414517-G02	X	X		
Front Cooling Fan (1)	44A419946-G01			X	X
Printed Wire Boards:					
XPS/2 (2)	44B418210-G02				X
XPS/3 (3)	44B418210-G03	X	X	X	X
XPS/4 (3)	44B418210-G04	X	X	X	X
LOG/3	44C417521-G03				X
LOG/4	44C417521-G04			X	
LOG/5	44C417521-G05		X		
LOG/6	44C417521-G06	X			
LOG/8	44C417521-G08	X	X	X	X
HVS/5 (5)	44C417519-G05	X	X	X	
HVS/6 (5)	44C417519-G06				X
LMB/2 (6)	44C417523-G02				X
LMB/3 (6)	44C417523-G03		X		X
LMB/4 (6)	44C417523-G04				X
LMB/5 (6)	44C417523-G05				X
LMB/6 (6)	44C417523-G06	X	X	X	X
LMB/8 (6)	44C417523-G08	X	X	X	X
LMB/16 (6)	44C417523-G16	X	X	X	X

TABLE 5-10 NOTES

(1) When replacing older style fan (part number 44A417784-001, cable (44A411828-G05) is required.

(2) Early style XPS board containing power filtering components. Not interchangeable with XPS/3 or XPS/4.

(3) For use on TermiNet 310/320/330/340 Line Printers with power filtering components in the AC switch box assembly. Not interchangeable with XPS/2. XPS/4 replaces XPS/3 but should not be replaced by XPS/3.

(4) May be used to replace LOG/2 shipped in early Printers.

(5) HVS/5 replaces HVS/3 and HVS/6 replaces HVS/4.

(6) See Table 5-5, PWB WIRE STRAPS for applications of LMB boards.

Also listed are those parts that are common among different models.

Any omission of instructions covering replacement or adjustment of particular parts or subassemblies is intentional, and should be understood to mean that those particular procedures should not be attempted in the field.

CAUTION

THE ALIGNMENT BARS ATTACHED TO EITHER END OF THE HAMMER AND PRINT BELT ASSEMBLY PLUS THE MATING ALIGNMENT BARS ATTACHED TO THE SIDE FRAMES ARE SET AT THE FACTORY ON SPECIAL FIXTURES. THESE CANNOT BE ADJUSTED IN THE FIELD.

Instructions are also omitted for replacement of certain minor parts such as mechanical latches, hinges, linkages, etc. as replacement procedures for these parts should be obvious to the serviceman.

Also note that no instructions are included for removal of the main frame from the bottom cover. Unlike the TermiNet 300 and 1200 Printers, the TermiNet 340 Family of Line Printers are designed to permit all servicing without removal of the main frame.

In running any print tests to check the operation of the printer, always be sure that an ink ribbon cartridge is installed.

CAUTION

OPERATING PRINTER WITHOUT AN INK CARTRIDGE INSTALLED MAY RESULT IN EXCESSIVE PRINT FINGER WEAR. FAILURE TO OBSERVE THIS CAUTION WILL VOID PRINTER WARRANTY.

TO INSURE TYPE FINGERS ARE NOT CAUGHT IN INK RIBBON, ROTATE PRINT BELT ONE COMPLETE REVOLUTION BY MANUALLY ROTATING MOTOR BELT COUNTERCLOCKWISE. (PULL TOP OF MOTOR BELT TOWARD THE JACKSHAFT PULLEY). THIS PRECAUTION SHOULD BE REPEATED EACH TIME A SERVICE ROUTINE REQUIRES REMOVAL OF THE RIBBON CARTRIDGE.

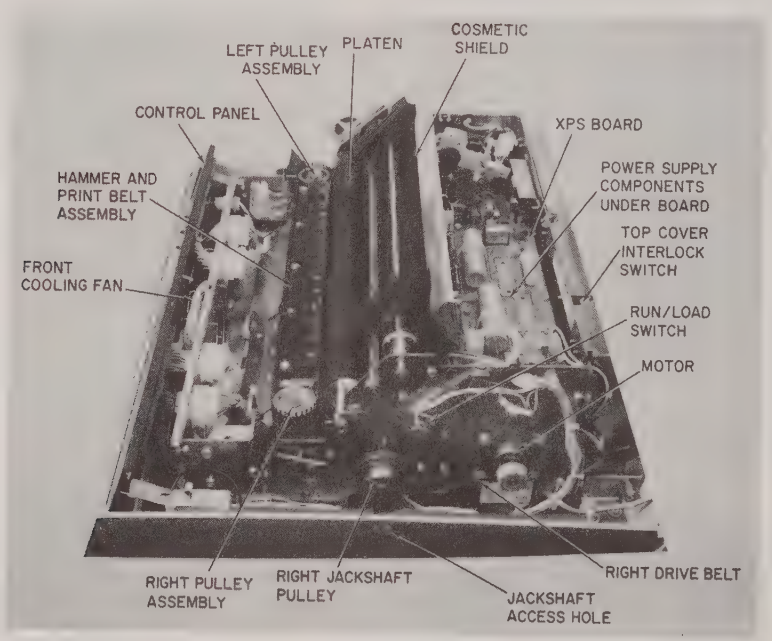


Figure 5-11. TermiNet 340 Line Printer — Right Side PLH-8049

CAUTION

Exercise care when removing or installing printed wiring boards on the mother board to avoid damage to connector pins. At installation, if more than normal resistance is felt when a PWB connector engages the mother board contacts, DO NOT USE EXCESS FORCE. Withdraw the board, examine the pins to ensure that none are bent, then realign the PWB. Straighten any pins found bent.

COSMETIC SHIELD
(Figure 5-11)

1. Remove paper.
2. Open top cover.
3. Remove the two hex head mounting screws with star washers from each end of cosmetic shield, and slide shield up out of main frame.
4. Replace by reversing above procedure.

PLATEN
(Figure 5-11)

1. Open top cover and remove paper.
2. Release both platen latches on either side of main frame.
3. Carefully lift right end of platen up enough to clear right side frame.
4. Slide platen to right as far as possible.
5. Carefully lift left end of platen up until it is free.

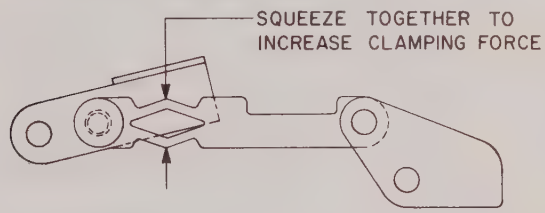
CAUTION

For printers with serial number 02920 and higher, make sure platen has later style platen gear (44B500798-001) containing 36 teeth.

6. When replacing platen, lower left end down so that platen gear is beside and to the right of its mating gear. Make sure plastic guard at left is on top over platen gear.

7. Lower right end of platen down until it is almost resting on right side frame.

8. Carefully slide platen to left while rotating platen slightly to mesh platen gear with mating gear.



PLH-7020

Figure 5-12. Adjusting Platen Clamp Assembly

9. Lower right end of platen down until it is seated into notch in right side frame.

10. Lock platen latch on each side of main frame. If latches do not clamp platen tight enough to prevent bearings from turning on main frame, adjust them by gently squeezing diamond shaped portion of arm as illustrated in Figure 5-12.

11. Push in on platen knob, and rotate counter-clockwise to check operation.

12. Install paper and close top cover.

POWER SUPPLY (XPS) BOARD

(Figure 5-11)

1. Disconnect printer from AC power source.

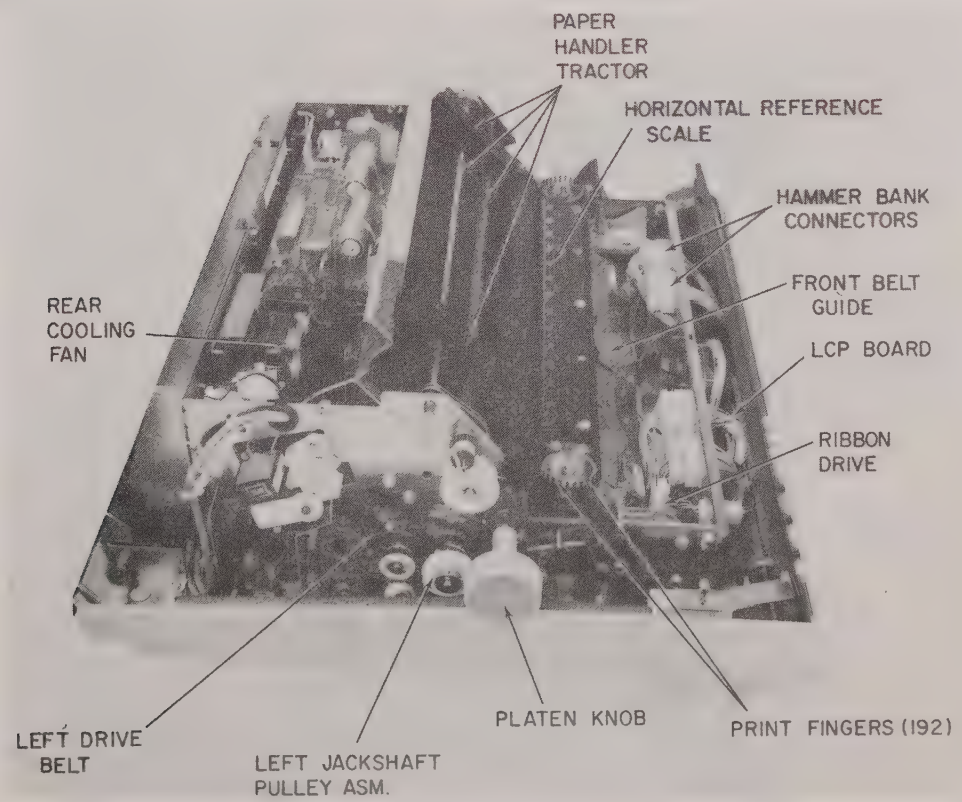
2. Raise top cover.

3. Remove cosmetic shield.

4. Loosen the three power supply cover screws and slide cover off.

5. Remove all connectors from the XPS board.

6. Take out five hex head mounting screws and remove board.



PLH-8050

Figure 5-13. TermiNet 340 Line Printer — Left Side

7. Install XPS by reversing steps 4, 5, and 6.

WARNING

DO NOT TURN POWER ON WITHOUT POWER SUPPLY COVER IN PLACE.

8. Set power switch to ON and check printer operation.

9. Replace cosmetic shield and lower top cover.

BUSTLE BOARDS
(Figure 5-14)

Before attempting to replace a bustle board, the following precautions should be read and understood.

HANDLING OF PRINTED WIRE BOARDS

The printed wire boards used in the printer are normally very reliable. However, it is possible to damage boards by improper handling, shipping, storing, or with contamination from dust or grease. In addition, boards containing an integrated circuit chip (IC) may be damaged by an electrostatic discharge (static electricity), especially in a low-humidity environment. The following guidelines for working with printed wire boards are suggested to avoid circuit board damage.

1. Do not subject boards to unnecessary shock or vibration. Be careful when handling boards to avoid dropping.

2. Store boards only in clean, dry, and oil or grease free areas. Avoid storing boards near electrostatic copiers or other devices capable of generating static electricity.

3. Do not store, ship, or transport boards loose. Boards containing an IC should be stored, transported, or shipped only in metallic foil-lined bags or metallic foil wrappings. Other boards may be stored, transported, or shipped in foil-lined bags, plastic bags, or plastic sheeting.

4. Avoid stacking boards on top of each other in storage; store in a vertical position if possible.

5. Always handle boards by their edges. Handling in any other manner can contaminate boards or cause mechanical damage to components.

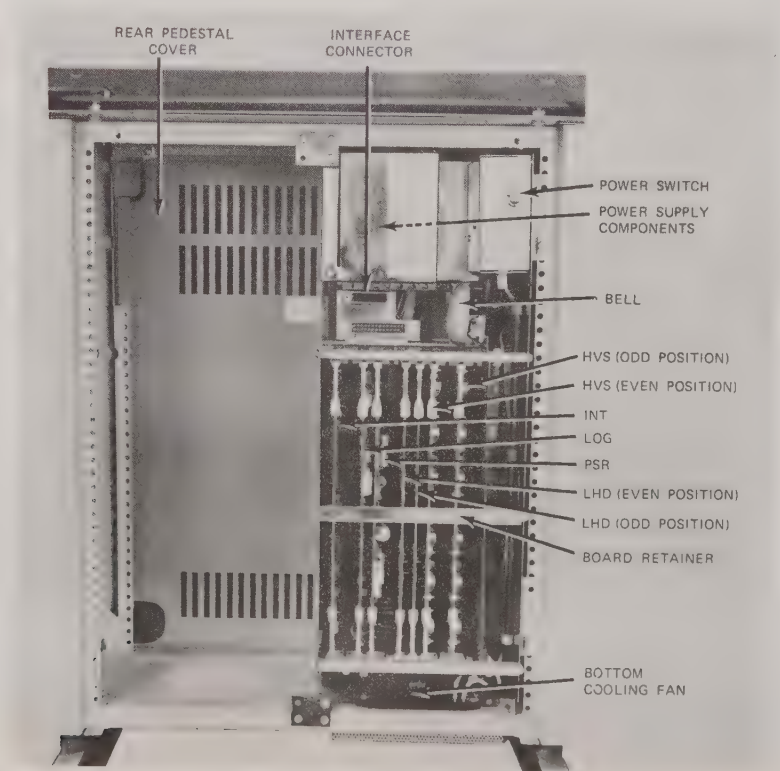


Figure 5-14. Bustle Assembly

PLH-6086

6. Do not touch plated contact fingers. Contamination can cause intermittent contact problems.

7. When handling boards containing an IC, avoid wearing nylon or other static-producing clothing, especially in very cold or dry weather. If available, wear anti-static smocks. If you are wearing static-producing clothing, and an anti-static smock is not available, remember to touch a grounded surface before handling boards containing an IC.

8. When working on boards with an IC, the work station should have a conductive material surface and conductive floormats connected to a common ground. When possible, connect the chip pins or board fingers to the conductive material surface.

9. Ground soldering iron tips and other electrical tools.

BUSTLE BOARD REPLACEMENT

The main electronic circuits for the printer are packaged on seven printed wire boards. These boards are housed in the bustle which is located inside of the pedestal. Proceed as follows:

1. Set power switch to OFF.

2. Remove front pedestal cover by loosening the two captive screws at top of cover.

3. Loosen screw and release latch on board retainer. Remove retainer.

4. Remove selected board by pulling both handles at top and bottom of board.

5. When board connectors are separated from the mating pins on mother board, the board will easily slide out of bustle.

6. Insert replacement board in proper bustle slot and push in with thumbs until board is fully seated.

7. Install board retainer.

8. Set power switch to ON and check for correct board operation.

9. Set power switch to OFF and replace front Pedestal cover.

PRINT FINGER
(Figure 5-13)

1. Open top cover.

2. Remove ribbon cartridge.

3. Rotate print belt counterclockwise until damaged finger is just moving off the left print belt pulley toward front of Printer.

NOTE

The reference fingers (one for each font in the print belt) with wide bottoms, also referred to as font fingers, can be removed by following the procedure below under "Font Tab Finger Replacement."

4. Grasp finger firmly (close to belt) with finger removal pliers and pull straight up and out of belt.

5. Grasp replacement finger as far down as possible and insert it into appropriate belt slot. Push replacement finger in approximately ¼ inch at a time. Take care not to bend finger.

6. Push finger down until wide flange is firmly seated against belt.

7. Check alignment on top of replacement finger in relation to other fingers in belt. If out of line, carefully bend finger to conform with other fingers.

8. Make sure all fingers are touching rebound belt.

FONT TAB FINGER REPLACEMENT

Font tab fingers are similar to all of the other print fingers with the exception that they have a tab welded on the bottom (see Figure 5-15). These fingers may be replaced only by the single ear type as illustrated in Figure 5-15.

1. Remove print belt.

2. Break welded-on font reset tab off bottom of finger.

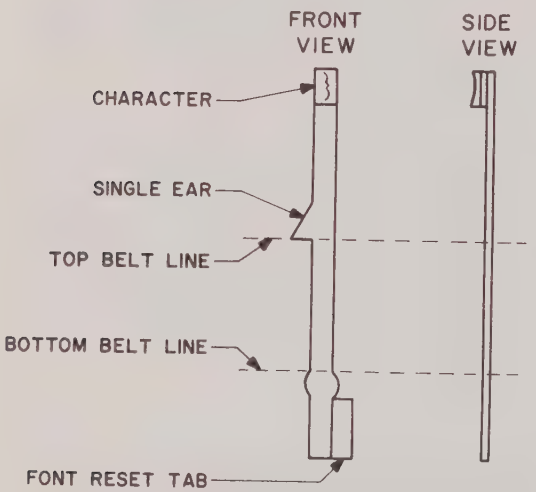
3. Smooth off any sharp edges or burrs on bottom of finger.

4. Pull finger up, out of belt from top side of belt.

5. Making sure the replacement finger is of the single ear type, insert replacement finger, character end first, into bottom side of belt. Push finger up through belt until single ear on finger is above top of belt.

6. Check that finger character is same as on other font tab fingers on belt, and that it is facing outside of belt.

7. Reinstall print belt in Printer.



PTM-6134

Figure 5-15. Font Tab Finger Detail

PAPER SHIELD ASSEMBLY

(Figure 5-16)

The plastic paper shield assembly contains the spring mounted paper tear-off bar. The entire assembly is easily replaced as follows:

1. Open top cover.

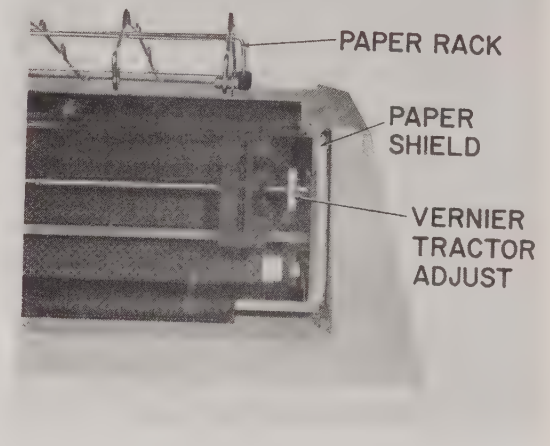
2. Gently squeeze the plastic mounting arms inward to free the shield assembly from the top cover.

3. Install paper shield assembly by reversing above steps.

PAPER RACK

(Figure 5-16)

The paper rack which attaches to the two brackets behind the paper shield can be removed by removing the screw and stud from either bracket. The paper rack can then be removed by tilting the rack enough to clear the bracket where the screw was removed, and moving it sideways to clear the other stud. To install the paper rack, the above procedure is reversed.



PLH-8052

Figure 5-16. Paper Shield and Rack

PAPER HANDLER TRACTOR

(Figures 5-13 and 5-18)

1. Open top cover.

2. Remove paper.

3. Unlock each tractor by pushing down on clamping levers.

4. Remove outside retaining ring from right end of upper tie rod, and remove washer and spring (see Figure 5-17).

5. Slide upper tie rod to left until right end is clear of side frame and remove tie rod from printer with attached thumb wheel. Thumb wheel can be removed from shaft by screwing it off end of shaft.

NOTE

Earlier models do not have the vernier tractor adjusting mechanism. On these models, the upper tie rod can be removed simply by removing two retaining rings and sliding the rod out of the main frame.

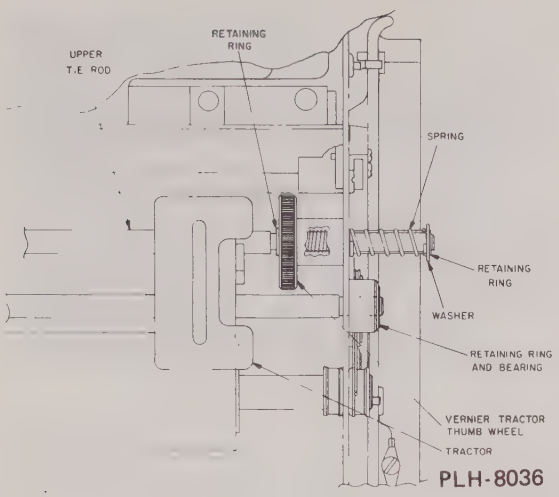


Figure 5-17. Vernier Tractor Adjusting Mechanism

6. Remove E ring from right end of tractor drive shaft.

7. Remove tractors as follows:

   a. Release lock on both tractors. Slide tractors to right of square shaft.

   b. Using right angle retaining ring pliers, relieve pressure of C clip at right of friction brake, then slide clip to right at least 6 inches.

   c. Using hex key wrench, relieve set screw that secures left bearing.

   d. Remove E ring holding white idler tractor drive gears onto fixed shaft on outside of left side frame.

   e. Remove white idler tractor drive gear.

   f. Slide square shaft to left far enough to permit sliding both tractors off the shaft at right end.

   g. Using right angle retaining ring pliers, slide C clip off right end of square shaft.

   h. While holding friction brake assembly in place, withdraw square shaft from left side frame.

      NOTE

      Rotate center adjustment for paper on right end of upper shaft to reduce as much pressure as possible on spring before removing C clip at right end of upper shaft.

   i. Remove C clip at right end of upper shaft.

   j. Remove retaining ring, washer and spring from right end of upper tie rod.

   k. Remove vernier adjustment knob by unscrewing counterclockwise (CCW).

   l. Remove E ring stop at left end of threaded area for vernier adjustment knob.

   m. Slide tractors off the upper tie rod as the tie rod is withdrawn to the right.

      NOTE

      The tractors can be interchanged by making a simple conversion. For example, if only a right hand spare tractor is available and the left hand tractor needs replacing, the available tractor can be easily converted to a left hand tractor. To convert a tractor, see the instructions below.

8. The bearing (see Figure 5-17), which engages the right end of the tractor drive shaft, can be replaced using a standard bearing puller (G.E. part number 44A410588-G01).

   NOTE

   The bearing discussed above in step 8 allows manual rotation of the platen and tractors in either direction.

   Earlier models used a roller clutch that allowed only forward rotation of the platen and tractors. When removing a roller clutch, the standard bearing puller referred to above can be used. The roller clutch must be pushed out toward the inside of Printer. Identifying marks on the clutch should also be inboard.

9. Replace tractors and linefeed friction brake as follows:

   a. Start square drive shaft through hole in left main frame. Then slide friction brake onto shaft.

   b. Using right angle retaining pliers, slide C clip onto shaft.

   c. Slide left tractor onto square shaft, followed by right tractor.

   d. Slide right end of shaft through bearing on right end.

      NOTE

      Do not attach E ring to right end of shaft until later.

   e. Place idler gear assembly on shaft at left side frame.

NOTE

If printer has the optional 6 or 8 Lines per Inch option, consult GEK-49324 for information on associated parts.

10. Slide upper tie rod (with vernier thumb screw attached to right end) through both tractors, friction brake, and hole in left side frame. Then slide rod through hole in right side frame; and install spring, washer, and retaining ring on right end of rod.

11. Position tractors in approximate operating position and visually inspect alignment of pins on tractors. If pins on left tractor are not aligned with those on right tractor, slide square shaft to left enough to disengage right tractor and rotate tractor hub 1/4 turn. Engage right tractor with shaft and reinspect pin alignment. If alignment is still incorrect, repeat above procedure until alignment is correct. When alignment is correct attach E ring to right end of square shaft.

12. Slide friction brake to extreme left side of printer and attach E ring to tie rod securing brake. Slide the C clip up to the friction brake.

13. Lubricate friction brake by placing one drop of SAE 10w-20w-40 motor oil on friction hub between end plates.

14. Install paper, adjust tractors, lock tractors in place by pushing up on clamping levers, close top cover, and check operation.

CONVERTING TRACTORS

The tractors are interchangeable. A right hand tractor

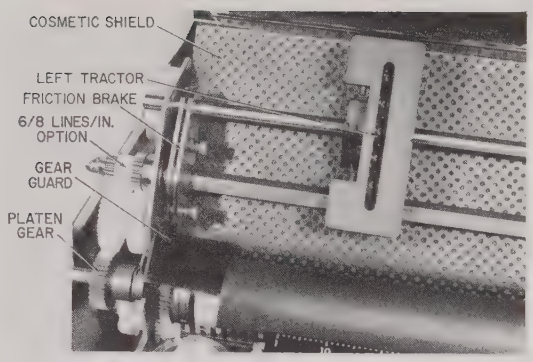


Figure 5-18. Paper Handler Tractor—Left Side
PLH-8053

can be used to replace another right hand tractor, or with a minor conversion, it can be used to replace a left hand tractor. The conversion procedure is as follows:

1. Position tractor on work surface as it would be in printer.

2. Remove cover spring.

3. Press out cover pins (from inside out) and remove cover.

4. Take out Phillips Head screw holding clamp assembly and remove assembly. Rotate clamp assembly so that lever is pointed down, and secure in place with the Phillips Head screw previously removed.

5. Turn tractor over from original position and install cover with the two pins and spring previously removed.

FRICTION BRAKE
(Figure 5-19)

Replaceable parts on the linefeed friction brake consist of the hub and two compression springs. These

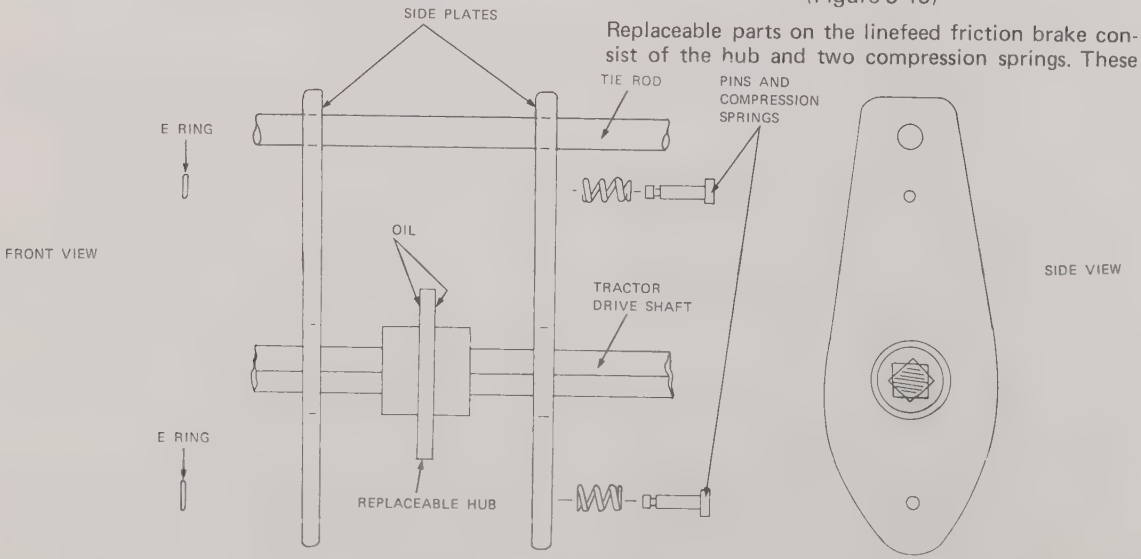


Figure 5-19. Friction Brake Assembly

parts can be replaced by removing the friction brake and disassembling it by removing the two E rings from the assembly.

TRACTOR DRIVE SHAFT GEAR AND BEARING
(Figure 5-19)

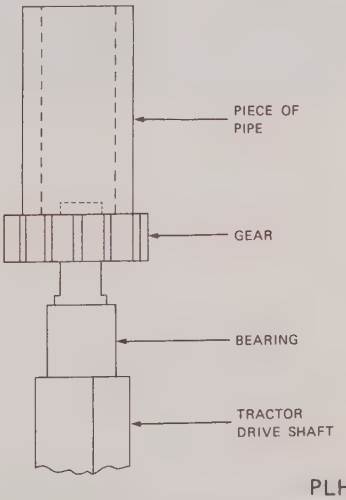
1. Open top cover.
2. Remove paper.
3. Remove E ring from right end of square drive shaft.
4. Unlock tractors by pushing down on clamping levers.
5. Slide square drive shaft out from the left side of printer.
6. With tractor drive shaft assembly out of printer, place assembly in a vertical position with gear end facing up. Support bottom of gear with an open end wrench or other suitable tool. Holding tool with supported shaft assembly against a work surface, gently tap shaft extending from gear with a plastic mallet until gear has moved to end of shaft. Gear should now be loose enough so that it can be pulled off the shaft. If replacing entire drive shaft assembly, make sure gear is compatible with mating gears. See CAUTION below.
7. If bearing is being replaced, it can be done easily at this time as it will slide over end of shaft after gear is removed.

Refer to PAPER HANDLER TRACTOR Step #7, on page 5-31.

CAUTION

For printers with serial number 02920 and higher, replace with latest 18 tooth style tractor drive shaft gear (44B500797-001). When using this gear on printers with serial numbers below 02920, replace tractor driving gear (idler) with later style gear (44B500726-001). Also, replace platen gear with later style 36 tooth gear (44B500798-001). Gear part number is stamped on inside of gears.

8. With bearing in place, push replacement gear on end of shaft as far as possible. Place shaft on a solid work surface in a vertical position with gear end facing up. Select a socket head nut driver or similar object such as a short piece of pipe which will slide over shaft while making contact with gear surface. Make sure tool does not have a large enough inside diameter to damage gear teeth when tool makes contact with gear. Holding shaft assembly in upright position described above, and with tool in place on gear, gently tap end of tool driving gear down onto shaft until gear is seated against shoulder on shaft. Check bearing to make sure it rotates freely on shaft.
9. Replace shaft assembly in printer by sliding assembly in from left side of printer. Make sure square shaft is properly engaged with hub in linefeed friction brake. Slide left and right tractors onto square shaft as shaft is placed in operating position.
10. Visually inspect alignment of pins between left and right tractors and correct alignment if necessary by slipping right tractor off shaft and rotating tractor hub ¼ turn at a time until pins are aligned.
11. Make sure tractor drive shaft gear is properly meshed with mating gear, and place E ring over right end of shaft. (See caution note on gear compatibility).
12. Install paper, adjust tractors, lock tractors in place by pushing up on clamping levers, close top cover, and check operation.



PLH-6047
Figure 5-20. Tractor Drive Shaft Gear Replacement

TOGGLE ASSEMBLY
(Figure 5-21)

1. Raise top cover.
2. Remove platen.
3. Remove E rings from each end of toggle assembly.
4. Slide assembly to left until right end clears sleeve in main frame.
5. Assembly is then removed by sliding it to the right until left end clears sleeve in main frame.

6. Replace toggle assembly by reversing above steps.

CAUTION

When replacing toggle assembly, sleeves must be inserted with shoulders on the outside of main frame.

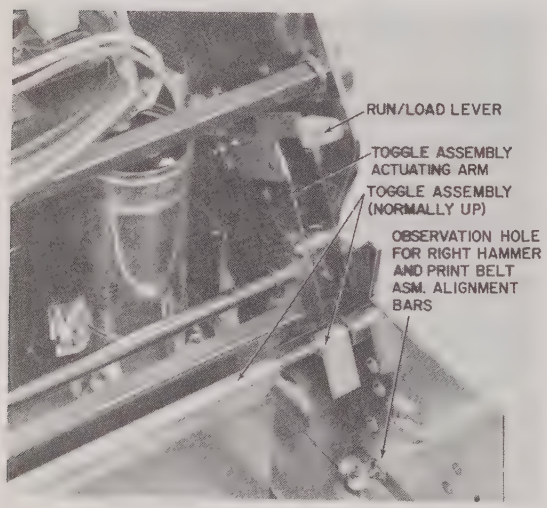

RUN/LOAD LEVER
TOGGLE ASSEMBLY ACTUATING ARM
TOGGLE ASSEMBLY (NORMALLY UP)
OBSERVATION HOLE FOR RIGHT HAMMER AND PRINT BELT ASM. ALIGNMENT BARS

Figure 5-21. Toggle Assembly

PAPER TENSION CONTROL
(Figure 5-22)

The paper tension control can be added to printers now in service. The parts required to provide this feature are shown in Figure 5-22. Proceed as follows:

1. Remove the existing toggle assembly.

2. Install the new toggle assembly (Figure 5-22).

3. Install the links on each end of the toggle assembly and secure with the retaining rings.

4. Use a spring hook tool to attach the retaining springs to the links and posts which hold the ink ribbon securing the arm assembly.

5. Actuate the RUN/LOAD lever in both directions and observe the movement of the toggle assembly.

6. Adjust the clearance between the platen and the paper holder with the RUN/LOAD lever in the LOAD position to obtain a gap of 0.004 inch, (0.1 mm). If the gap is less than 0.004 inch, proceed as follows:

   a. Loosen the securing screw (Figure 5-22, View B).

   b. Slide the assembled parts to obtain the specified clearance of 0.004 inch. (This clearance may be measured with a feeler gauge.

   c. Tighten the securing screw.

   d. Actuate the RUN/LOAD lever in both directions to ensure proper operation. Adjust the operation of the lever, if required, in accordance with the instructions provided in this chapter.

7. Place the RUN/LOAD lever in the RUN position. The toggle assembly must contact the paper pan on both ends. Tension required to provide this action must be between 3 to 6 oz (85 to 170 grams). Measure the tension on the left and right sides of the paper as follows:

   a. Remove the platen.

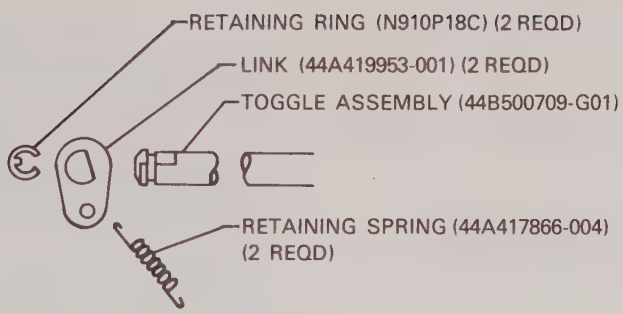
   b. Insert a single sheet of paper in the printer.

   c. Clamp a paper binder clip (or similar device) on the left and right top edges of the paper.

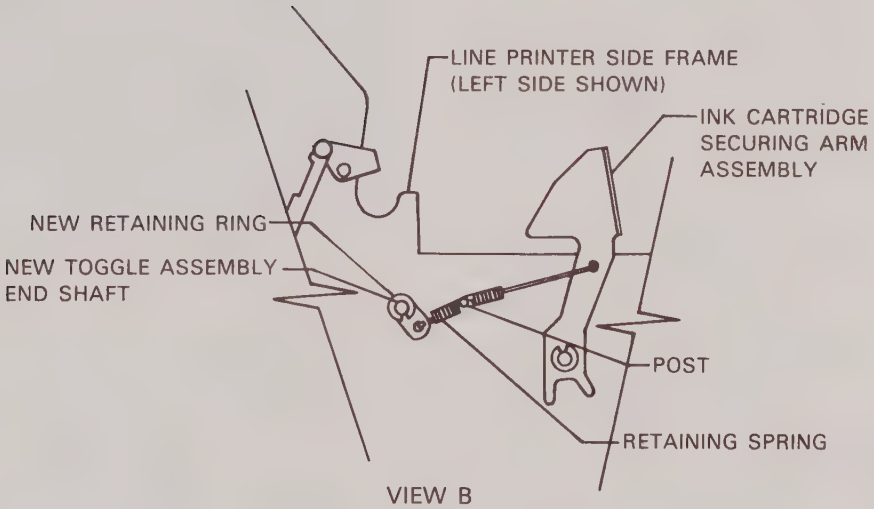
   d. Hook a utility push-pull gauge (manufactured by John Chatillon and Sons, New Garden NY), or equivalent, into each paper binding clip, in turn. The tension required to slip the paper through the printer must be as specified in step 7. If the tension required to move the paper is not within specified limits, adjust the gap (clearance) as required.

NOTE

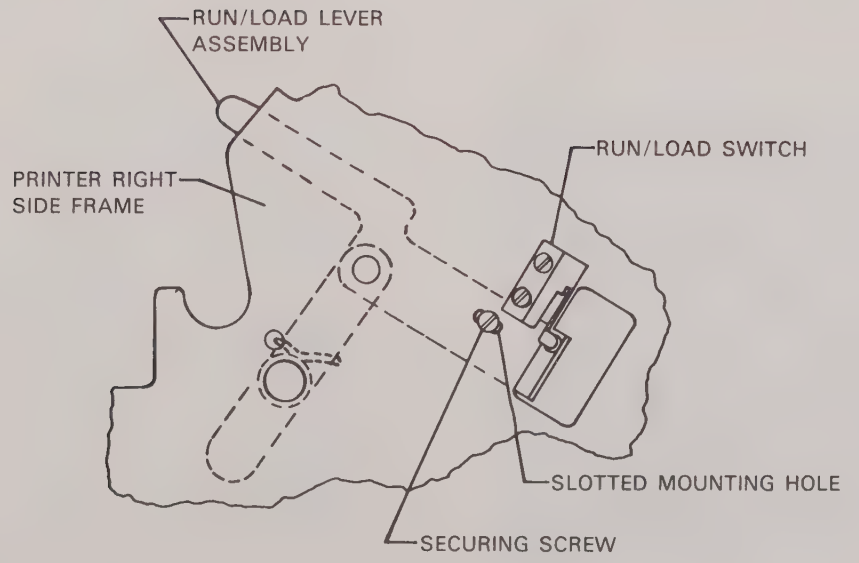
It is permissible to slightly bend the paper pan to attain the required tension on both sides of the paper.



VIEW A



VIEW B



VIEW C

Figure 5-22. Paper Tension Control Installation

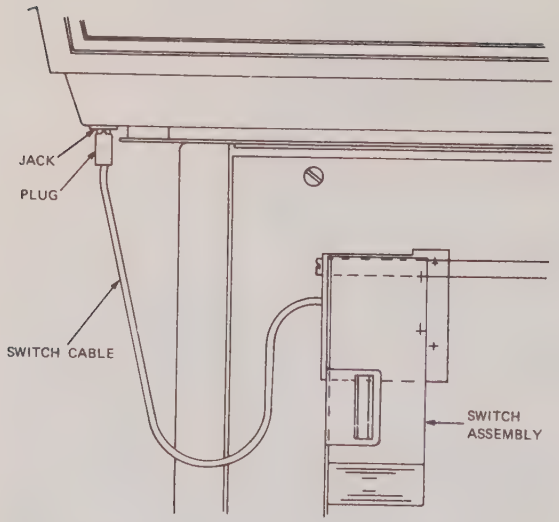


Figure 5-23. Front Load Paper Switch

FRONT LOW PAPER SENSOR
(Figure 5-23)

1. Set power switch to OFF.

2. Remove plug from jack under left front corner of printer.

3. Remove front pedestal cover.

4. Remove screw securing horizontal bar to switch assembly.

5. Remove switch assembly from pedestal cover.

6. Install switch assembly by reversing steps 1 through 5 above.

REAR LOW PAPER SENSOR
(Figure 5-24)

1. Set power switch to OFF.

2. Remove three screws attaching rear paper chute to rear of printer.

3. Slide paper chute with attached switch to left until switch clears printer cover through large cutout.

NOTE

If chute does not slide easily, open top cover and make sure switch wires are not caught into frame parts.

4. When chute is out far enough to expose switch terminals, remove wires from switch, and remove chute with attached switch as an assembly.

5. Install switch on paper chute. Switch is attached with two screws.

6. Connect wires to switch terminals.

7. Set power switch to ON and check for correct operation of switch.

NOTE

If front low paper sensor is installed, remove plug from jack under left front of Printer to enable rear low paper sensor.

8. Set power switch to OFF and complete installation of paper chute in Printer.

PAPER OUT SWITCH
(Figure 5-24)

1. Disconnect printer from AC power source.

2. Open top cover.

3. Remove power supply cover.

4. Remove platen.

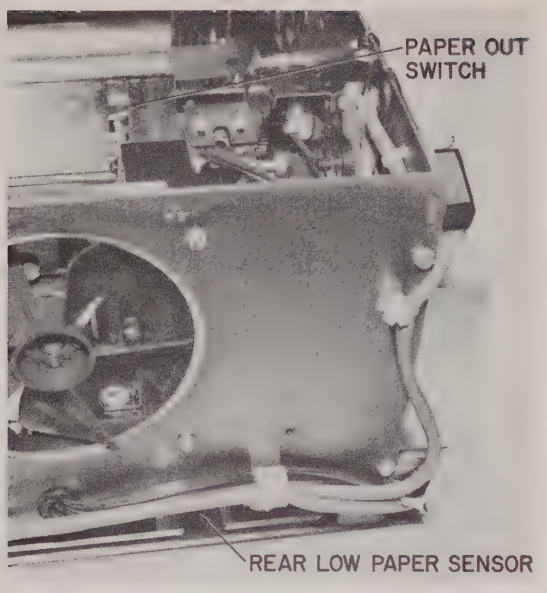
5. Remove cosmetic shield.

6. Remove the two switch mounting screws and two attached wires.

7. Attach wires to replacement switch and secure switch to mounting bracket with screws removed in previous step.

8. Install cosmetic shield, platen, and power supply cover.

9. Check operation of switch.



PLH 7039

Figure 5-24. Paper Sensors

NOTE

Switch adjustment will not normally be necessary. However, if adjustment is necessary the switch arm can be carefully bent to obtain correct contact with the paper.

TOP COVER INTERLOCK SWITCH

(Figures 5-11 and 5-25)

1. Disconnect printer from AC power source.

NOTE

Some early printers had the top cover interlock switch mounted directly on the rear frame of the printer. Newer model printers contain a mounting bracket for this switch which causes the switch plunger to be recessed. If it should become necessary to replace the top cover on one of the older model printers with one of the newer style top covers, order Interlock Switch Retrofit Kit 44C414926. This kit will provide parts and instructions to install the switch mounting bracket and other hardware needed to relocate the switch so it can be operated with the newer style top cover. The retrofit kit can also be used to modify a printer with the early style top cover as the switch actuator, which mounts on the inside of the top cover, is included in the kit.

2. Open top cover.

3. Using a pencil, place a mark on switch mounting bracket adjacent to bottom edge of each mounting tab on switch housing.

4. Remove the two mounting nuts securing switch housing to mounting bracket.

5. Turn switch housing around exposing switch and remove the two black and two white wires from switch terminals (see Figure 5-26).

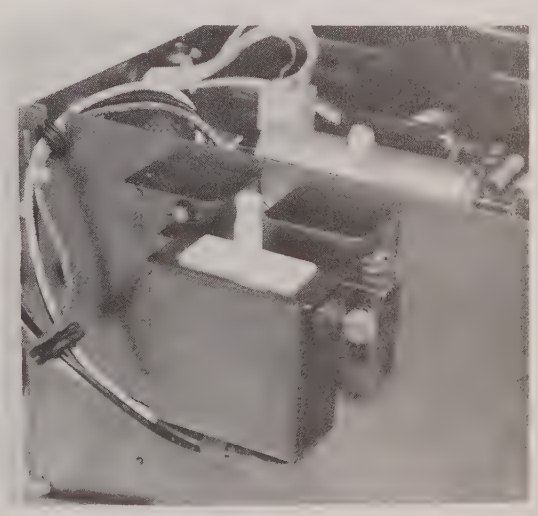
6. Squeeze the two plastic tabs together on sides of switch and pull switch up through top of switch housing.

7. Orient replacement switch with identifying marks on switch body facing out. Push switch into opening at top of switch housing until it snaps securely in place. Holding housing so that switch is exposed, connect the two white leads onto the outer two terminals at right end of switch. Connect the two black leads to the outer two terminals at left end of switch.

8. Turn switch housing around and place in position against mounting bracket.

9. Insert the two mounting screws previously removed and snug screws up finger tight.

10. Adjust switch assembly by lining up bottom



PLH-7023

Figure 5-25. Top Cover Interlock Switch

edges of mounting tabs with pencil marks made from step 3 above.

11. Tighten both mounting screws.

12. Connect printer to AC power source and check operation of switch by closing and opening top cover with Printer turned on. Printer motor should turn off when cover is raised 3/4 - 1 in. (19.1-25.4 mm). Adjust switch position if necessary. The interlock switch can be defeated (by a qualified serviceman only) while the top cover is open by pulling up on the switch plunger.

CONTROL PANEL AND LCP BOARD

(Figure 5-27)

1. Open top cover.

2. Remove four screws and flat washers from underside of bottom printer cover.

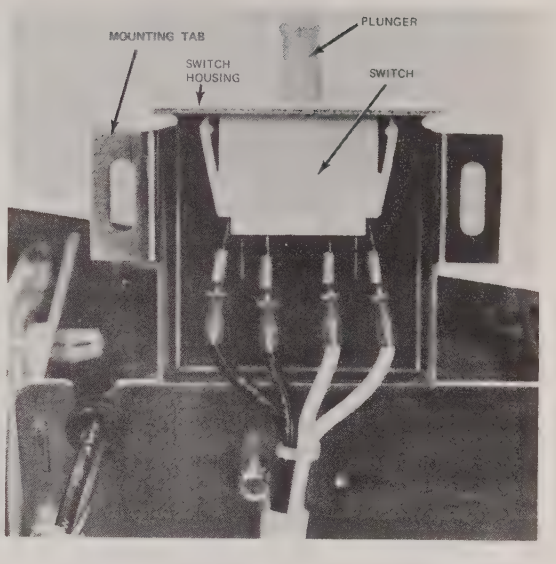
NOTE

Keep these screws separate from top mounting screws.

3. Remove two screws and flat washers from each end of top control panel brackets.

4. Lift up control panel and flip it over exposing the connector on the LCP board.

5. Remove two small retaining screws from connector on LCP board and remove connector.



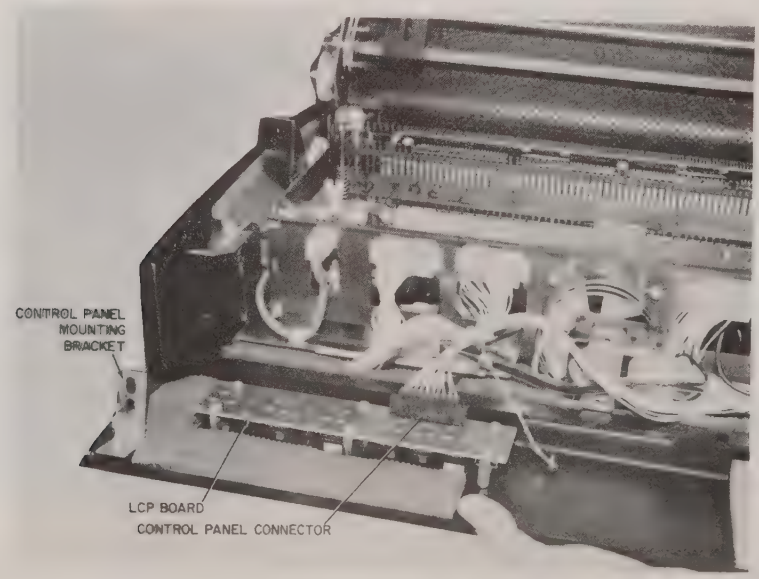
PLH-6091

Figure 5-26. Top Cover Interlock Switch Connections

6. Lay control panel face down on a padded work surface.

7. Remove the six LCP board mounting screws and flat washers. Lift LCP board away from control panel.

8. Install LCP board and control panel by reversing steps 4 through 7 above.



PLH-7024

Figure 5-27. Control Panel and LCP Board

9. Check operation.

10. Replace four bottom and four top mounting screws and washers.

11. Close top cover.

SWITCHES AND INDICATORS
(Figure 5-28)

The pushbutton switches and LED indicators on the control panel can be replaced as follows:

1. Remove control panel.

2. Remove LCP board from control panel.

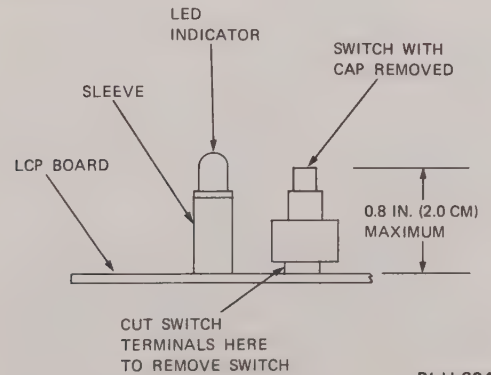
3. Locate defective switch or indicator. If removing a switch, cut switch terminals under switch and remove piece of each terminal remaining in the board one at a time using a small tip soldering iron to melt solder. If replacing an LED indicator, hold soldering iron on soldered leads of LED on solder side of board until solder melts and pull LED along with LED sleeve off board.

4. When installing a replacement LED indicator, make sure removed sleeve is installed with LED. This will provide support and assure correct mounting height for the LED.

5. When installing a replacement switch, position switch so that uppermost part of switch (pushbutton cap removed) is 0.8 in. (2.0 cm) from board surface. Ends of switch terminals on solder side of board should be bent over before soldering terminals in place.

6. Mount LCP board to control panel and position panel in Printer.

7. Check operation of all control panel switches and indicators.



PLH-6046

Figure 5-28. Switch and Indicator Replacement

8. Secure control panel with the eight mounting screws previously removed.

RUN/LOAD SWITCH
(Figures 5-11 and 5-29)

1. Raise top cover.

2. Place RUN/LOAD switch in the LOAD position.

3. Label the three wire leads to switch and using a pencil tip soldering iron, remove leads from switch.

4. Remove the two switch mounting screws, retaining plate, and switch from right side frame.

5. Install switch with the two mounting screws and retaining plate removed in step 4.

6. Solder wire leads to switch terminals.

7. Turn printer on using top cover interlock switch.

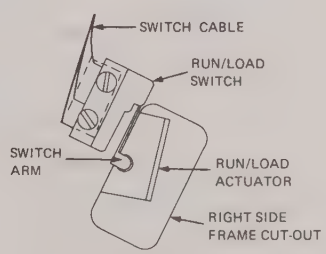
8. Check RUN/LOAD switch by moving RUN/LOAD lever alternately to the RUN and LOAD positions. Printer should turn off when lever is placed in the LOAD position. When lever is placed in the RUN position, it should be possible to start printer by pressing MOTOR ON pushbutton on control panel. If switch requires adjustment, it should be adjusted by placing RUN/LOAD lever in RUN position and adjusting switch roller against protruding arm (actuator) until switch activates.

VERTICAL FORMAT UNIT (VFU) AND SLEW STROBE ASSEMBLY
(Figures 5-30 — 5-34)

VFU REPLACEMENT

1. Raise top cover, and remove rear pedestal cover.

2. Disconnect VFU cable.



PLH-6036

Figure 5-29. RUN/LOAD Switch Adjustment

3. Loosen both VFU mounting screws.

4. Rotate front of VFU down to provide enough slack in VFU drive belt so that belt can be removed.

5. Hold VFU with one hand while removing mounting screws, and remove VFU with attached cable.

NOTE

When replacing an earlier style VFU assembly with the present version, an extension cable (Part Number 44B501210-G03) is required. This is necessary because of the shorter cable length on the replacement units.

6. Install VFU by reversing above steps. Adjust VFU (see ADJUSTMENT instructions below) and check operation.

ADJUSTMENT OF THE VFU

CAUTION

To ensure error-free operation of the VFU, it is extremely important that the linefeed solenoid arm in relation to the highest clutch lobe be within the specified tolerances—preferably at the bottom end of the range—0.005 in. (0.13 mm).

ADJUSTMENT LEVER

The VFU adjustment lever (G.E. part number 44B500781-001) makes VFU adjustment easier. Early production models do not have this lever. The VFU adjustment lever can be easily added to any VFU that does not have one by following the instructions below:

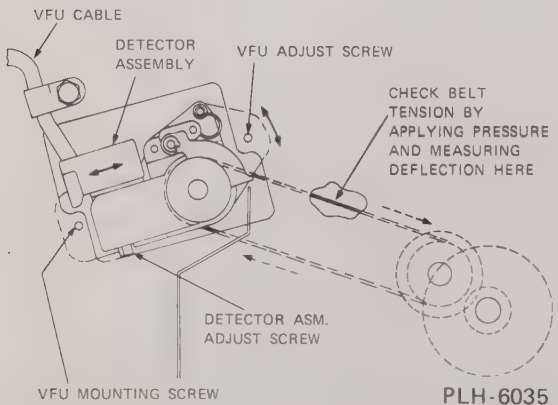


Figure 5-30. VFU Detail

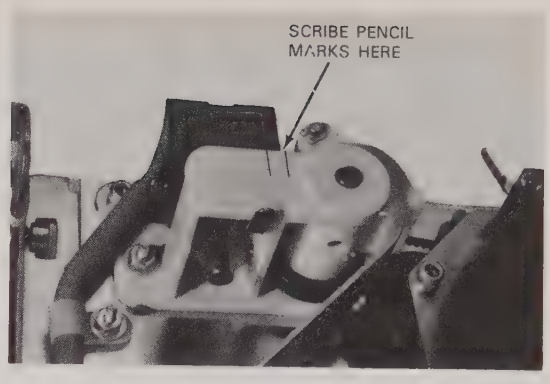


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Figure 5-31. VFU Adjustment

1. Remove the No. 4 hex shaft adjusting screw and associated flat and lock washers.

2. Retain lock washer and No. 4 hex shaft screw for reuse.

3. Place adjustment lever, with lever handle up, into position under the VFU assembly housing.

4. Reinstall and lightly hand-tighten the No. 4 hex shaft adjusting screw and lock washer.

5. Perform detector and emitter assembly adjustment in accordance with the following procedures.

METHOD NO. 1

1. Loosen VFU detector adjust screw (see Figure 5-30).

2. Use tape loop with sprocket and FF and/or VT as needed. Insert tape loop in VFU.

3. Press LINEFEED pushbutton on control panel to move tape until VT or FF holes are near front edge of detector assembly (see Figure 5-31).

NOTE

On printers which do not have a LINEFEED pushbutton, LF commands will have to be received from a remote source by the printer. Alternately, the printer TEST mode may be entered (via pushbutton switch or Interface board switch as appropriate) to produce printing and subsequent, desired line feeds.

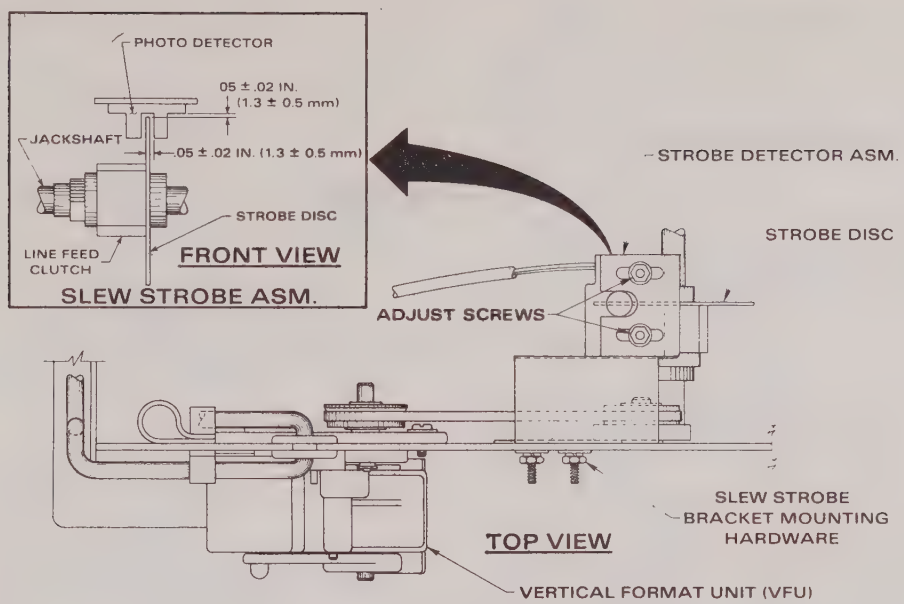


Figure 5-32. Slew Strobe Assembly

4. Using adjust lever, position front edge of detector assembly tangent to edge of VT or FF holes as illustrated.

5. Tighten adjust screw.

CAUTION

Do not overtighten. Limit torque on adjust screw to 3 in.-lbs. Exceeding this torque limit may break plastic housing. Make sure detector-emitter assembly does not move from the set position while the screw is being tightened.

METHOD NO. 2

1. Connect voltmeter to frame ground (as reference) and TP1 on the LOG PWB. Use at least a 20,000 ohms/volt voltmeter.

2. Loosen adjust screw. Using adjustment lever, move VFU detector-emitter assembly toward rear of printer until voltmeter indicates -12 to -15 volts.

3. Move adjustment lever forward until voltmeter indicates zero. Mark VFU assembly housing at the point where it is in line with front edge of adjustment lever. (See Figure 5-31).

4. Continue to move adjustment lever forward until voltmeter again indicates -12 to -15 volts. Mark

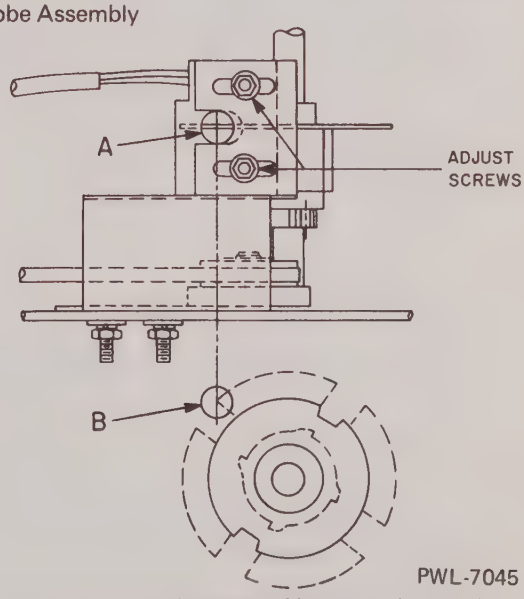


Figure 5-33. Alignment of Detector Assembly With Strobe Disc Slot

VFU assembly housing at the point where it is in line with the front edge of adjustment lever.

5. Move adjustment lever to the rear of printer until stop is reached.

6. Slowly move adjustment lever forward until the front edge of lever is midway between the two marks on VFU assembly housing.

7. Before tightening adjust screw, see CAUTION above under Method No. 1.

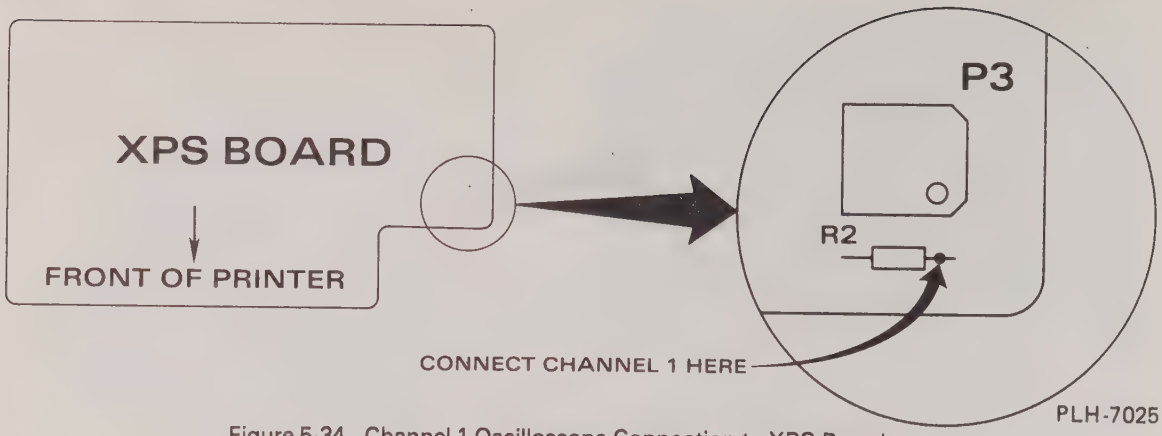


Figure 5-34. Channel 1 Oscilloscope Connection to XPS Board

SYNCHRONIZING VFU TAPE WITH FORM

(For models with FORM FEED pushbutton only.) Synchronize platen with tape by pressing FORM FEED pushbutton on control panel to allow VFU mechanism to advance paper to beginning of form as determined by the form format being used. Move paper form by using the manual platen adjust knob until top of form is in correct vertical position ready for printing.

REPLACEMENT OF STROBE DETECTOR ASSEMBLY

1. Disconnect printer from AC power source.

2. Remove paper.

3. Open top cover and remove power supply cover.

4. Remove cosmetic shield.

5. Disconnect slew strobe cable located in left rear area inside main frame. Remove cable clamp securing cable to inside of left side frame.

6. Remove the two mounting nuts and washers securing detector assembly (TVFC/1) to bracket. Do not loosen bracket mounting nuts on side frame.

7. Reinstall strobe detector assembly by reversing steps 1 through 6.

8. Adjust strobe detector assembly (see procedures below).

ADJUSTMENT OF SLEW STROBE ASSEMBLY—METHOD A

1. Turn print belt counterclockwise to ensure that linefeed solenoid arm and clutch lobe are engaged.

2. Loosen nuts on detector assembly (TVFC/1) adjust screws illustrated in Figure 5-33.

3. Slide detector assembly (TVFC/1) forward or backward until leading edge of strobe disc slot (Point B in Figure 5-33) is aligned with center of viewing hole (Point A in Figure 5-33) in TVFC/1 printed wire board. When aligning detector assembly, viewing should be done from directly over top of TVFC/1 PWB.

4. Tighten adjust screw nuts.

ADJUSTMENT OF SLEW STROBE ASSEMBLY—METHOD B

1. Adjust mechanically to obtain dimensions illustrated in Figure 5-32.

2. Set up a dual trace oscilloscope as follows:

   a. Set voltage on both channels to 5V/DIV. DC.

   b. Set time base to 2MS/DIV.

   c. Trigger on positive going edge of Channel 1.

3. Connect Channel 1 to resistor R2 located at the right side near P3 on the XPS board (connect to resistor lead nearest right end of board as illustrated in Figure 5-34.

4. Remove front Pedestal cover and connect Channel 2 to TP1 on LOG Board.

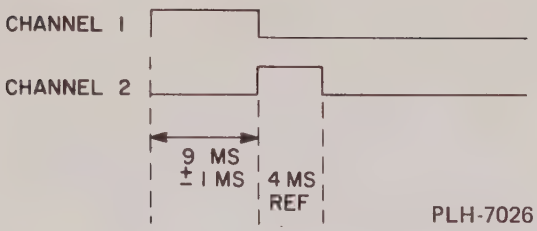


Figure 5-35. Typical Waveforms

5. Apply power to printer, start motor and initiate repeated line feeds. The time to the leading edge of pulse in Channel 2 should be 9 ms ± 1 ms (see Figure 5-35).

6. If observed waveform is not as illustrated in Figure 5-35, loosen strobe detector assembly adjust screws (see Figure 5-33) and move as follows:

a. If the time to leading pulse edge is too long, move detector board (TVFC/1) toward rear of printer.

b. If the time to leading pulse edge is too short, move detector toward front of printer.

7. When pulse timing is properly adjusted, tighten all nuts in detector board and bracket and recheck pulse timing.

8. Disconnect oscilloscope leads and replace front pedestal cover.

9. Reinstall cosmetic shield and power supply cover.

10. Close top cover and install paper.

11. Connect printer to AC power source and check operation.

BUSTLE ASSEMBLY

(Figure 5-14)

The instructions below are given with the assumption that the reader is facing the rear of the pedestal unless specified otherwise.

1. Disconnect power plug from AC power source.

2. Remove front and rear pedestal covers.

3. Loosen the four bustle cover screws at rear of bustle. Lift up and remove cover.

4. Remove the two ground wires secured with a hex head screw, star washer and nut from left side of pedestal frame.

5. Remove AC power connector at top left of bustle.

6. Remove the three hex head screws along with star washers and flat washers securing the four cable clamps to bustle frame.

7. Remove bell connector.

8. Remove ground wire secured with a slotted screw, two star washers, and a nut from left side of pedestal.

NOTE

The hammerbank, control panel, VFU, and photocell connectors each contain two small retaining screws which must be removed before the connectors can be removed.

9. Remove the four hammerbank connectors from center of mother board.

10. Remove control panel connector from bottom right of mother board.

11. Remove the photocell and VFU connectors from bottom left of mother board. These connectors are keyed to avoid incorrect connector placement.

12. Remove single orange wire from right side of mother board.

13. Remove the red and black wires from left side of mother board.

14. Facing the front of the pedestal, remove the four slotted screws securing bustle frame to pedestal. Slide bustle out from rear of pedestal.

CAUTION

When storing or working on bustle assembly, take necessary precautions to avoid damage to connecting pins on mother board.

15. To replace bustle assembly, reverse steps 3 through 15 above.

CAUTION

All wires connected to the mother board terminal tabs with sleeve type connectors must fit tight. If any are loose, the connectors should be closed up slightly to obtain a good fit with their mating terminals.

16. Connect power plug to AC power source, and check operation of printer.

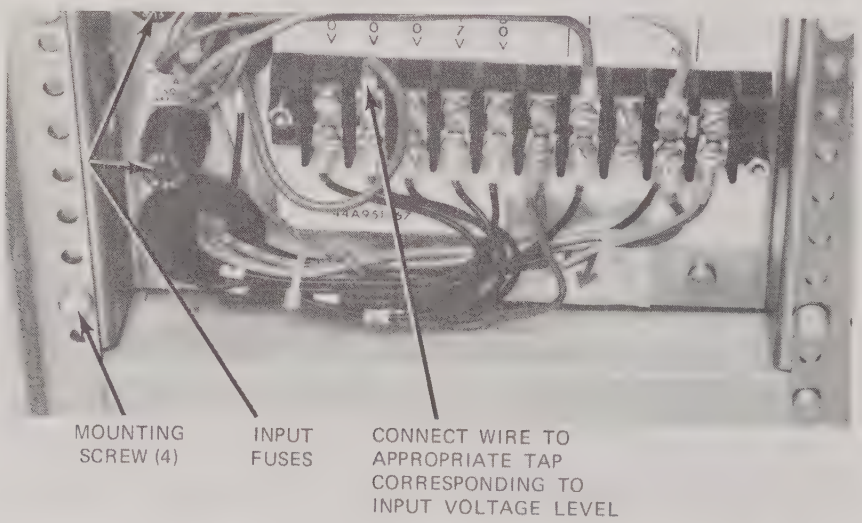
17. Replace pedestal covers.

MULTIPLE VOLTAGE POWER SUPPLY

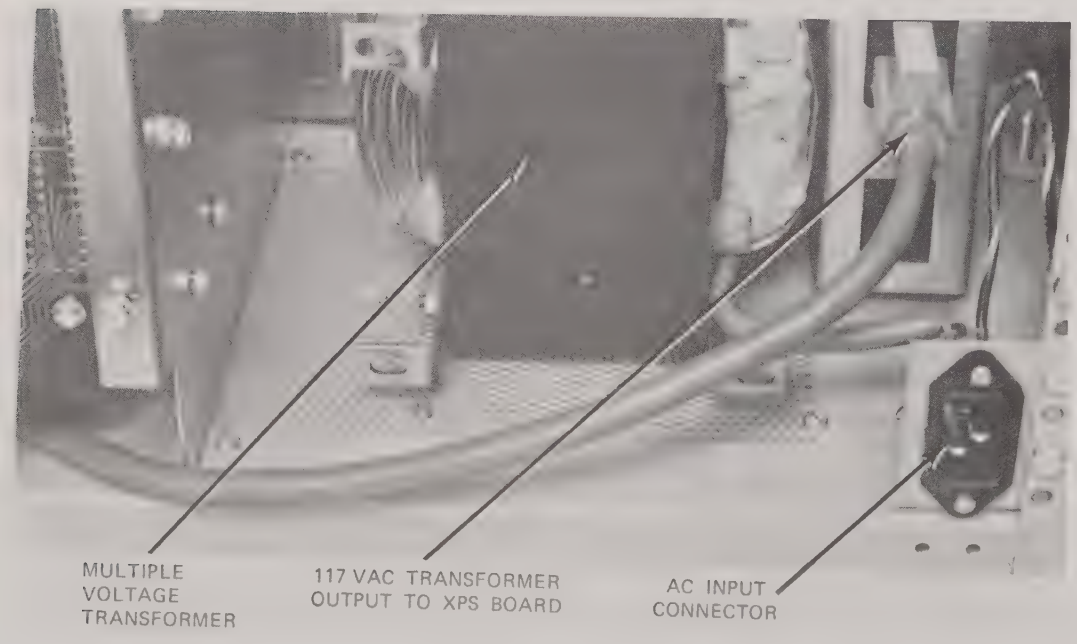
(Figure 5-36)

The following procedure for replacing the multiple voltage power supply will apply only to printers having this option.

1. Disconnect power plug from AC power source.



Front View



REAR VIEW

PLH-6093

Figure 5-36. Multivoltage Power Supply

2. Remove front and rear pedestal covers.

3. Disconnect power cord at rear of pedestal from AC connector at lower right corner (as viewed from rear) of pedestal. Remove connector and ground wire from pedestal frame.

4. Disconnect printer power plug from 117V AC outlet on multiple voltage power supply.

5. Remove the four mounting screws securing the multiple voltage power supply to Pedestal and bustle frame.

6. Replace the multiple voltage power supply by reversing steps 3 through 5 above.

CAUTION

Make sure replacement power supply is correctly wired for the particular voltage level being supplied by the AC power source before connecting the power cord to the source.

7. Connect power cord to AC power source.

8. Check operation of printer.

9. Install Pedestal covers.

BELL
(Figure 5-14)

1. Set power switch to OFF.

2. Remove front pedestal cover.

3. Remove bell gong secured with a slotted screw.

4. Loosen bell assembly from pedestal by removing the two mounting nuts and star washers.

5. Rotate bell assembly to expose two screw terminals on bottom. Remove the lead wires from terminals.

6. Replace bell by reversing steps 3 through 5 above.

7. Set power switch to ON and check operation of bell.

8. Install front Pedestal cover.

AC SWITCH AND FILTER ASSEMBLY
(Figure 5-37)

The AC switch and line filter are housed in the metal box on the top right side of the bustle assembly. The replacement procedure is as follows:

1. Disconnect AC line cord.

2. Remove front and rear pedestal covers.

3. Remove bustle assembly from pedestal (see instructions under BUSTLE ASSEMBLY).

4. Disconnect the two wires to bottom cooling fan in bustle, and loosen cable clamps securing these wires to right side of bustle. Pull wires out of cable clamps.

5. Disconnect AC power input plug on bottom of switch box.

6. Find AC power output cable from switch box. Remove connector on this cable from bracket on rear

of pedestal. Also, remove cable clamp securing this cable to right side of bustle.

7. Disconnect switch box ground wire from bustle frame.

8. Remove the two hex head screws from right front corners of switch box and remove switch box with enclosed line filter from bustle assembly.

NOTE

When replacing either the AC line filter or switch, see Figure 5-37, and Table 5-11 for correct wire connections.

9. Reinstall AC switch box by reversing steps 3 through 8.

10. Connect AC line cord to power source, and check switch operation.

11. Reinstall front and rear pedestal covers.

TABLE 5-11
AC SWITCH AND LINE FILTER CONNECTIONS

wire color	FROM	TO
Black	P24-3	SW4-1
White	P24-1	SW4-2
Brown	SW4-3	Line Filter (Line Side)
Blue	SW4-4	Line Filter (Line Side)
Green	Frame of Power Supply	Line Filter (Line Side)
Brown	TB1-3	Line Filter (Load Side)
Blue	TB1-1	Line Filter (Load Side)
Black	J11-1	TB1-3
White	J11-2	TB1-1
Green/Yellow	J11-3	Connec. to Frame of Bustle (E22)
Black	J15-1	TB1-3
White	J15-3	TB1-1

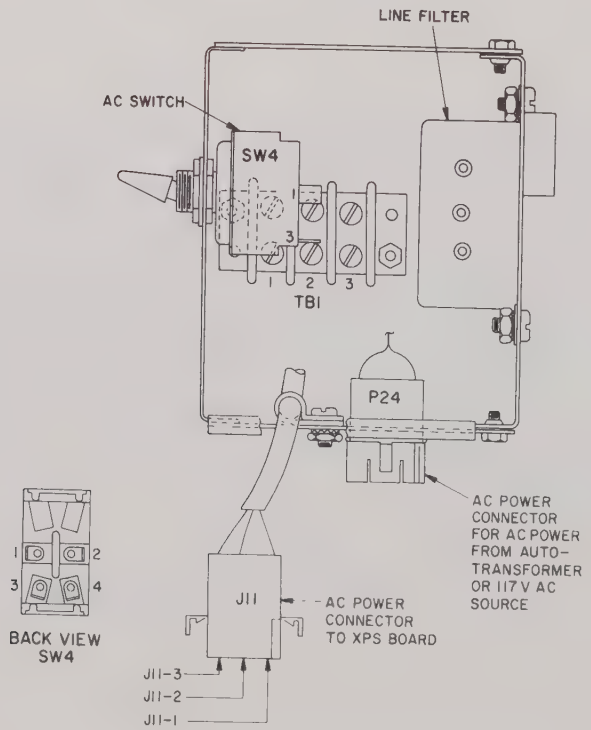


Figure 5-37. AC Switch and Filter Assembly

PLH-7027

POWER SWITCH
(Figure 5-14)

1. Disconnect printer fom AC power source.

2. Remove front pedestal cover.

3. Remove the two screws from front of switch housing.

4. Remove wires from switch and remove switch from housing.

5. Install switch, connect wires to switch terminals, and install housing with screws removed previously.

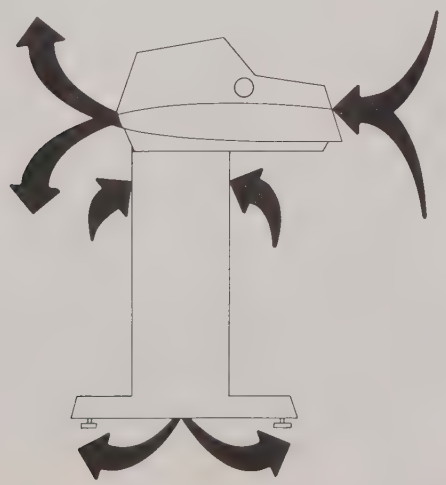
6. Connect printer to AC power source and check switch operation.

7. Install front pedestal cover.

COOLING FANS
(Figure 5-38)

The entire family of TermiNet 340 Line Printers utilize a rear and a bottom cooling fan. Additionally, the TermiNet 340 Line Printer requires a front cooling fan to dissipate rapid heat build up caused by the high speed operation of the hammer bank coils.

It is particularly important when replacing any cooling fan that the replacement fan be oriented to achieve the correct air flow through the printer and pedestal as illustrated in Figure 5-38.



PLH-6048

Figure 5-38. Correct Cooling Air Flow

FRONT COOLING FAN
(Figure 5-39)

1. Raise top cover.

2. Remove control panel.

3. Disconnect in-line connector.

NOTE

If old style fan with terminals on fan housing is being replaced with newer style (part number 44A419946-G01), also replace fan cable assembly (part number 44A411828-G05) with type containing connector on end.

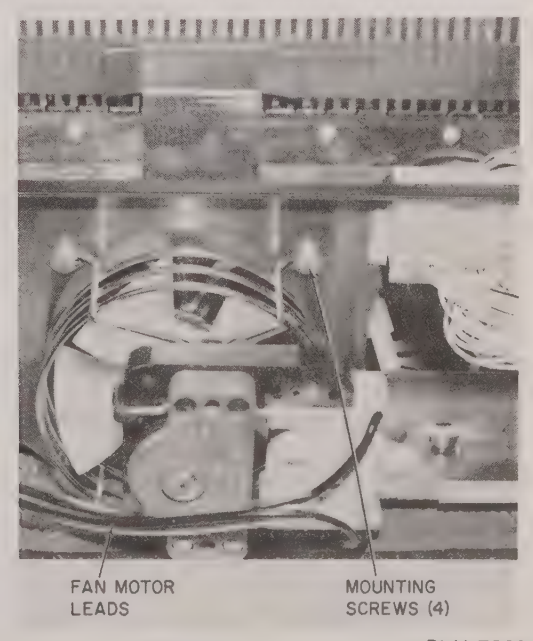
4. Remove four fan mounting screws and washers, and remove fan.

CAUTION

When replacing fan, orient fan so that direction of air flow is toward inside of printer.

5. Secure fan with hardware previously removed.

6. Connect in-line connector and make sure fan wires are dressed away from fan blade.



PLH-7028

Figure 5-39. Front Cooling Fan

7. Connect control panel cable and set control panel in place, but do not replace control panel hardware until later.

8. Use top cover interlock switch to turn power ON. Turn Printer ON, and check operation of fan.

9. Turn power OFF with top cover interlock switch.

10. Install control panel hardware previously removed.

REAR COOLING FAN

(Figure 5-13)

CAUTION

DO NOT USE A 44B500708-G01 REPLACEMENT FAN ASSEMBLY ON PRINTERS OPERATING ON 50 HZ INPUT POWER. USE REPLACEMENT FAN ASSEMBLY 44A417868-001 OR 44B500708-G02 ONLY FOR 50 HZ OPERATION. ANY ONE OF THE ABOVE THREE FAN ASSEMBLIES CAN BE USED FOR 60 HZ OPERATION, HOWEVER.

1. Disconnect printer from AC power source.

2. Raise top cover.

3. Remove power supply cover.

4. Remove fan leads from XPS board.

5. Remove the four screws, nuts and washers securing fan to rear frame, and remove fan.

CAUTION

When installing fan, orient fan so that direction of air flow is toward outside of printer.

6. Replace hardware previously removed to secure replacement fan.

7. Connect fan leads to XPS board.

8. Replace power supply cover and check operation of fan.

BOTTOM COOLING FAN

(Figure 5-39)

1. Turn power OFF.

2. Remove front and rear pedestal covers.

3. Remove all bustle boards

4. Remove bustle assembly from pedestal.

5. Disconnect the two motor leads from the motor.

6. To remove the cooling fan from the bustle, remove the four nuts, star washers, and flat washers from the four hex head mounting screws.

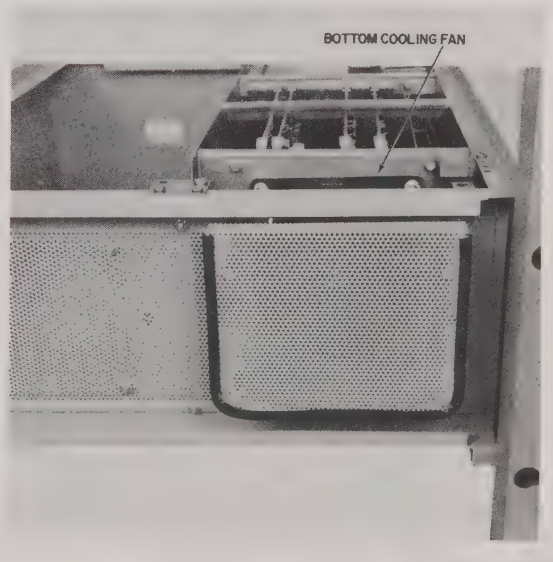
CAUTION

When installing the replacement fan make sure it is oriented to force air out at the bottom of the pedestal.

7. Reverse steps 3 through 6 above.

8. Turn power ON and check operation of fan. Verify that air is being exhausted from bottom of Pedestal.

9. Install pedestal cover.



PLH-6095

Figure 5-40. Bottom Cooling Fan.

POWER SUPPLY

(Figure 5-41)

1. Disconnect printer from AC power source.

2. Raise top cover.

3. Remove cosmetic shield.

4. Remove power supply cover.

5. Remove all connectors on XPS board.

6. Remove wire leads from motor start capacitor located on power supply.

7. Remove four power supply hex head mounting screws and lift power supply out of main frame.

8. Install power supply by reversing steps 4 through 7.

NOTE

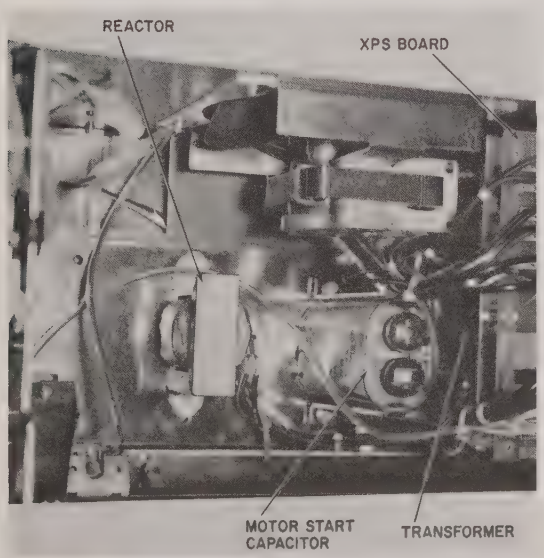
When installing power supply, red motor lead goes to inside of front pair of terminals on motor start capacitor. The black and blue wires go to the rear pair of terminals.

9. Turn power ON, and check Printer operation.

10. Install cosmetic shield and lower top cover.

MOTOR
(Figure 5-11)

1. Remove power supply.



PLH-7029

Figure 5-41. Power Supply

2. Loosen the four Allen Head cap screws securing motor to right side frame.

3. Slide motor forward to allow removal of right drive belt.

4. Remove motor by removing the four motor mounting screws and lock washers.

CAUTION

When installing motor, position motor so oil holes are on top.

5. With motor in place and correctly oriented, install the four Allen Head cap screws and lock washers, but do not tighten screws.

6. Install right drive belt and adjust to correct tension (see Table 5-4) by shifting motor position. When belt tension is correct, tighten motor mounting screws.

7. Install power supply.

LEFT DRIVE BELT
(Figures 5-13 and 5-42)

1. Loosen the two screws holding small plate under left front of printer. Remove plate (see Figure 5-44).

2. Reach up through access hole and slip belt off pulley under hammer and print belt assembly.

3. Open top cover and remove belt.

4. Loosen idler screw on top, rear idler.

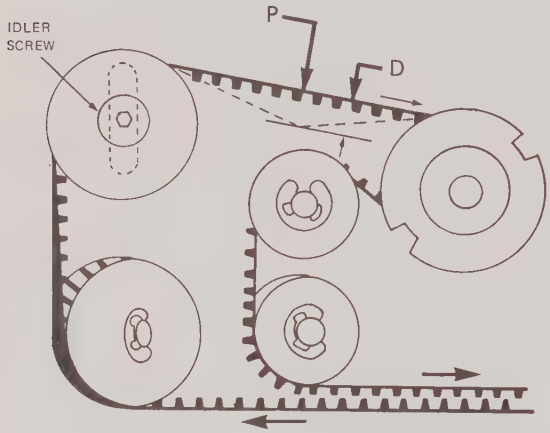
5. Route replacement belt over pulleys as illustrated in decal on left side frame.

6. Reach up through access hole under printer and slip belt over pulley under hammer and print belt assembly.

7. Adjust belt tension by moving top, rear idler up or down. Before proceeding to make final adjustment, first adjust for maximum belt tension. Belt tension is correct when a 4 ounce (114 g) downward pressure will deflect belt 0.1 to 0.30 inches (2.5 to 7.6 mm). When belt tension is correct, tighten idler screw.

8. Rotate print belt counterclockwise and check to make sure left idler pulleys are turning freely.

9. Install access plate under printer and close top cover.



PLH-6043

Figure 5-42. Left Drive Belt Adjustment

HAMMER AND PRINT BELT ASSEMBLY

(Figures 5-11 and 5-46)

1. Raise top cover.

2. Remove ribbon cartridge.

3. Remove the five mounting screws from side frame on each end of hammer and print belt assembly.

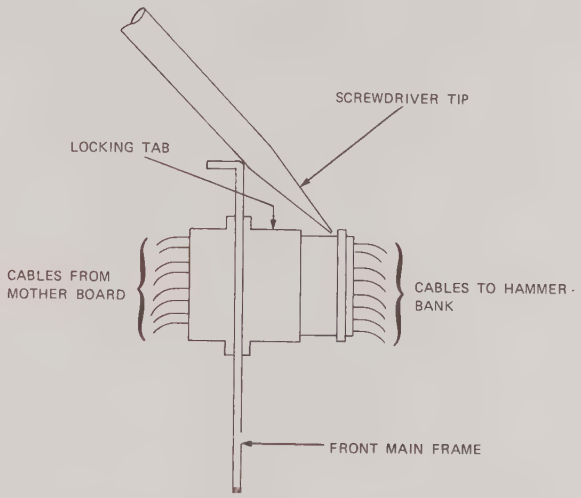
CAUTION

DO NOT LOOSEN THE THREE SMALLER SCREWS SECURING ALIGNMENT BARS TO SIDE FRAMES. THE ADJUSTMENT OF ALIGNMENT BARS IS CRITICAL AND CAN ONLY BE DONE AT THE FACTORY.

4. Disconnect the four large connectors in front main frame. If special connector removal tool is not available, connectors can be loosened using only a screwdriver as follows:

a. Release connector lock by prying up on small tab located in top center of inside portion of connector.

b. Rest the screwdriver shank on top of front main frame with tip against lip on inside portion of connector. Gently tap along connector lip until the connector halves begin to separate, then pull connector apart (see Figure 5-43).



PLN-6038

Figure 5-43. Hammerbank Connector Removal

5. Disconnect the four single hammerbank conductors — two black and two red.

6. Disconnect photocell cable. The connector is located in left, front main frame.

7. Remove access hole cover under left, front of Printer, and slip left drive belt off pulley under hammer and print belt assembly.

8. Lift hammer and print belt assembly straight up out of main frame.

CAUTION

DO NOT LOOSEN SCREWS SECURING ALIGNMENT BARS TO ENDS OF HAMMER AND PRINT BELT ASSEMBLY. THE ADJUSTMENT OF ALIGNMENT BARS IS CRITICAL AND CAN ONLY BE DONE AT THE FACTORY.

9. Before replacing hammer and print belt assembly, make sure toggle assembly is in upright

position with small arm making contact with arm on RUN/LOAD lever.

10. Lower hammer and print belt assembly down into main frame until alignment bars on assembly are resting firmly against alignment bars on side frames.

11. Insert five mounting screws previously removed through side frames into each end of hammer and print belt assembly. Turn screws in, but, leave them loose.

12. Check mating of alignment bars on both sides through observation holes in side frames. If bars are not flat against each other, grasp each bottom, front corner of printer and gently twist main frame by alternately lifting up on each corner. While doing this, observe alignment bars. When bars are correctly mated together, tighten the five mounting screws on each side of main frame.

NOTE

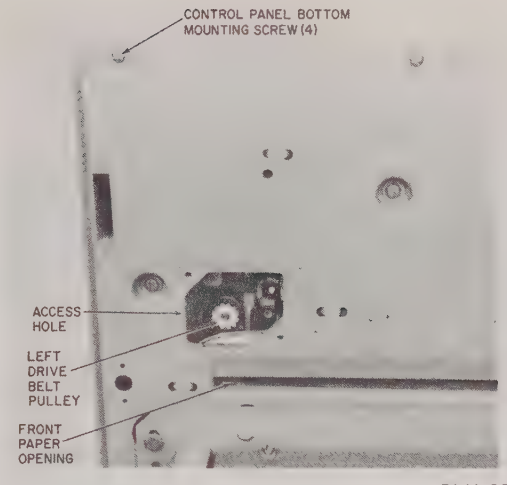
Frame will remain in desired position (alignment bars perfectly mated together) if the four screws securing bottom of printer to top of pedestal are loosened and a screwdriver is used as a temporary shim between printer and pedestal. The technique is to observe the side of the printer where a gap exists between bottom of printer enclosure and top of pedestal on that side. Push the screwdriver in until the gap disappears. Check alignment bars on other side of printer to make sure they are correctly mated, and tighten the five mounting screws on each side of main frame. Remove screwdriver and tighten four screws securing printer to pedestal.

13. Slip left drive belt over pulley under hammer and print belt assembly by reaching up through access hole under left, front of printer.

14. Rejoin large hammerbank connectors. Check connector labels to assure correct mating of connectors.

NOTE

Hammerbank connectors are keyed to prevent erroneous connections. The connectors also have identifying labels attached to their top side.



PLH-6097

Figure 5-44. Access Hole

15. Rejoin hammerbank single connectors, and photocell connectors.

CAUTION

Make sure cooling fan wires are dressed away from front cooling fan (TermiNet 340 Line Printers).

16. Some model printers have certain optional equipment installed on the hammerbank. If applicable to the printer being serviced, install this optional equipment on the replacement hammerbank.

17. Install ribbon cartridge and check operation.

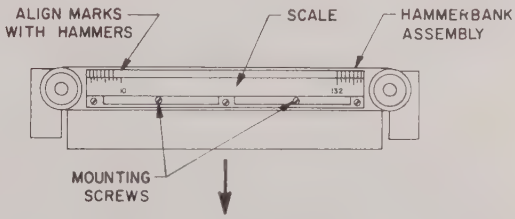
18. Install cover over access hole under left, front of printer.

HORIZONTAL SCALE

(Figure 5-45)

If the printer is equipped with a horizontal scale, it can be removed with the two screws illustrated in Figure 5-45. If the printer is not equipped with the scale, one can be added by ordering Kit No. 44A411444-G01.

Adjustment of the scale is possible by loosening the mounting screws and sliding the scale left or right until the marks line up with the corresponding hammers.

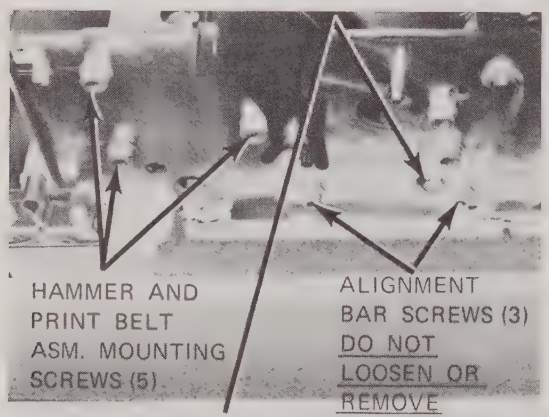


PLH-8054

Figure 5-45. Horizontal Scale.

NOTE

Removal of the horizontal scale is required when using a timing gauge.



PLH-6098

Figure 5-46. Hammer and Print Belt Assembly Removal

REBOUND BELT

(Figure 5-51)

1. Open top cover.

2. Remove ribbon cartridge.

3. Grasp rebound belt near either print belt pulley and remove belt.

4. Replace rebound belt by working rib side of belt into groove in rebound bar, and stretching belt around print belt pulleys making sure belt rib is in pulley grooves. Visually inspect belt installation to make sure belt is not wrapped around any of the print fingers.

5. Rotate print belt counterclockwise a few revolutions to make sure rebound belt is correctly seated.

6. Install ribbon cartridge.

7. Close top cover.

PAPER HOLDER

(Figure 5-55)

1. Open top cover.

2. Remove ribbon cartridge.

3. Remove hammer and print belt assembly.

4. Remove the six small screws and washers securing paper holder to belt guide. DO NOT loosen larger belt guide screws as this will destroy belt guide adjustment.

5. Install paper holder using the six screws and washers previously removed.

6. Install hammer and print belt assembly in printer.

7. Install ribbon cartridge.

8. Close top cover and check operation.

PRINT BELT AND ADJUSTMENT OF MAGNETIC BELT GUIDE AND REBOUND BAR

(Figures 5-46 and 5-48)

PRINT BELT REPLACEMENT

1. Open top cover.

2. Remove ribbon cartridge.

3. Remove rebound belt.

4. Insert a 10-32 screw approximately 1½ or 2 inches in length through hole in right side frame and into threaded hole in tension support casting. Turn screw in until it moves tension arm assembly to its extreme left end of travel. This will take all tension off the print belt making its removal much easier.

NOTE

A part number 44A500974 adjusting screw assembly (consisting of a 10-32 x 1½ inch screw and a threaded spacer) may be used in place of the 10-32 screw called for in step 4. This assembly may be left permanently installed on the printer for use when needed.

5. Work the print belt up over both print belt pulleys until it is free.

CAUTION

EXERCISE CAUTION DURING THE FOLLOWING STEP TO ENSURE THAT THE LOWER ENDS OF THE PRINT FINGERS DO NOT GET BETWEEN THE DUST SHIELD AND THE APERTURE IN FRONT OF THE PHOTOCELL. FAILURE TO OBSERVE THIS PRECAUTION MAY RESULT IN DAMAGE TO THE PHOTOCELL ASSEMBLY.

6. Install print belt by reversing steps 3, 4, and 5 above.

CAUTION

Make sure bottoms of print fingers are in slot in photocell assembly.

7. Rotate print belt counterclockwise a few revolutions to make sure there is no interference with the print fingers.

8. Install ribbon cartridge.

9. Close top cover.

VERTICAL ADJUSTMENT OF MAGNETIC BELT GUIDE

In the unlikely event that light printing would occur at either the upper or lower portions of printed characters, after changing a print belt, the following procedure should be followed for adjusting the magnetic belt guide.

1. Open top cover.

2. Remove ribbon cartridge.

3. Remove hammer and print belt assembly..

4. Remove rebound belt and print belt.

5. Remove the large slotted screw on either end of the magnetic belt guide.

6. Lift up belt guide taking care not to misplace any of the shims located underneath.

7. To compensate for light printing, belt guide should be raised or lowered as follows:

a. When light printing at tops of characters occurs — lower belt guide.

b. When light printing at bottoms of characters occurs — raise belt guide.

The print belt is raised or lowered by adding or removing shims as required. In most cases, the belt guide will not require more than 0.005 in. (0.13 mm) adjustment to correct any printing deficiency. Shims are available in 0.003 inch (0.08 mm), 0.005 inch (0.13 mm), 0.007 inch (0.18 mm), or 0.010 inch (0.25 mm) sizes.

NOTE

When shim sizes are not known, a micrometer must be used to determine thickness of shims.

8. After making shim change under ends of belt guide, replace the two belt guide mounting screws, but do not tighten them as belt guide must be adjusted horizontally (see procedure below).

9. Remove both print belt pulleys. Remove nut and loosen set screw to remove left pulley, and remove grip ring to remove right pulley.

10. Make the same shim adjustment under both print belt pulleys as was done under belt guide.

11. Install both print belt pulleys.

CAUTION

Exercise care not to overtighten the hex nut in the following step.

12. Install the lockwasher and hex nut on the pulley. Tighten the nut only enough to compress the lockwasher, then tighten the set screw to secure the pulley to the shaft.

13. Use an alignment gauge to check vertical alignment of print belt pulley grooves with rebound bar and magnetic belt guide (see Figure 5-47).

14. Make horizontal adjustment on belt guide (see procedure below).

15. Install print belt and rebound belt.

16. Install Hammer and Print Belt Assembly.

17. Check tracking of rebound belt. If rebound belt tends to ride out of grooves in either the print belt pulleys or rebound bar when the pulleys are rotated, make a vertical adjustment to the rebound bar. This is done by removing the slotted screw from each end of the rebound bar and placing or removing shims underneath the bar.

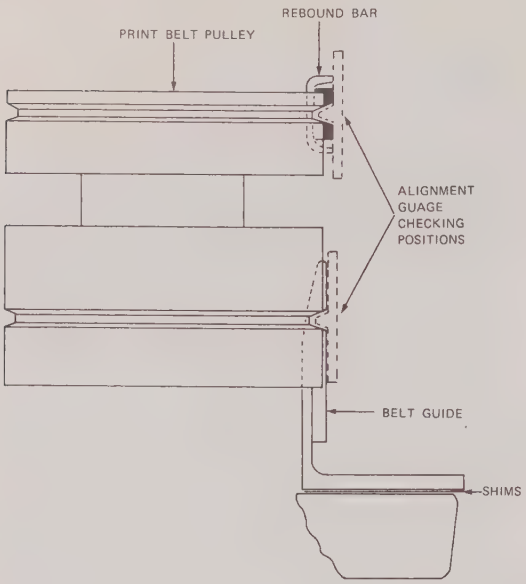
CAUTION

DO NOT LOOSEN ANY OTHER SCREWS ON TOP OF HAMMERBANK AS THESE WILL AFFECT A CRITICAL FACTORY ADJUSTMENT.

Before tightening the end rebound bar screws, make sure magnetic surface of rebound bar is 0.031 in. (0.79 mm) from outside crowned edge of print belt pulleys (right pulley in normal running position). Use same procedure as outlined below for horizontally adjusting magnetic belt guide.

NOTE

Latest style rebound bar (44B502239) which has a bow in the center, requires no adjustment or shims. When installing, place so that center of bar touches hammer bank before ends.



PLH-6041

Figure 5-47. Alignment of Magnetic Belt Guide and Rebound Bar With Print Belt Pulleys

18. Install ribbon cartridge.

19. Install paper and check print quality.

HORIZONTAL ADJUSTMENT OF MAGNETIC BELT GUIDE

1. Open top cover.

2. Remove ribbon cartridge.

3. Remove hammer and print belt assembly.

4. Insert a 10-32 x 1½ or 2 inch screw into the threaded hole in side of tension support casting. Turn screw in until it just makes contact with the tension arm assembly. This will hold right print belt pulley in its normal running position after print belt has been removed.

5. Remove rebound belt and print belt.

6. Loosen large slotted screw on either end of the belt guide.

7. Holding a straight edge against the right end of belt guide, move the belt guide until a clearance of 0.039 ± 0.003 inch (1.0 ± 0.08 mm) is obtained between outer surface of right print belt pulley and straight edge. Snug down right belt guide screw and repeat above procedure for left end of belt guide. When adjustment is complete, tighten down both belt guide screws and recheck clearance on each end.

8. Install print belt and rebound belt.

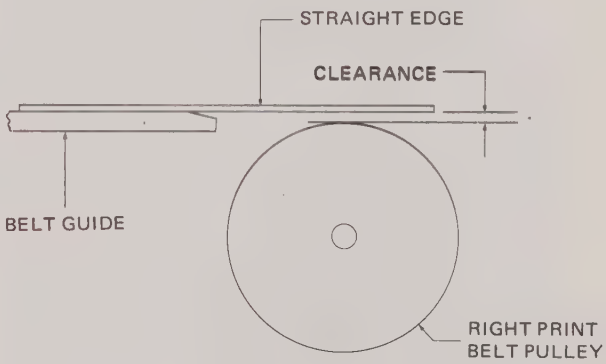
9. Remove 10-32 screw from side of tension support casting.

10. Rotate print belt counterclockwise a few revolutions and check for binding.

11. Install hammer and print belt assembly.

12. Install ribbon cartridge.

13. Close top cover.



PLH-6042

Figure 5-48. Magnetic Belt Guide Horizontal Adjustment

FRONT BELT GUIDE
(Figure 5-51)

1. Open top cover.

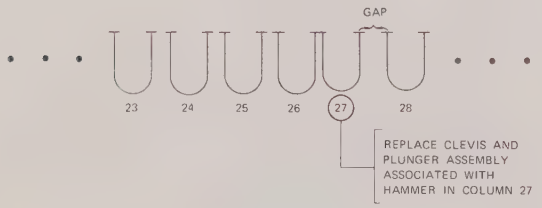
2. Remove ribbon cartridge.

3. Remove the two front guide mounting screws and remove guide.

4. When guide has been installed, adjust for a clearance of 0.050-0.070 inch (1.3-1.8 mm) between guide and print belt.

CLEVIS AND PLUNGER ASSEMBLIES

The usual symptom associated with a clevis and plunger assembly requiring replacement will be gapping (abnormal spacing between characters) in the printed copy (see Figure 5-49). An excellent test to determine if gapping is occuring is to print a full line by repeating the character "U". If a pattern of gaps appear in the printed line, adjust Printer timing using the timing gage (see PHOTO-CELL ADJUSTMENT), and repeat the test. If one or more gaps still appear in the printed copy, the clevis and plunger assembly associated with each gap should be replaced. Normally, the clevis and plunger assembly associated with the hammer which printed the character just left of the gap will be the one needing replacement. The procedure for replacing a clevis and plunger assembly is outlined below.



PLH-6127

Figure 5-49. Portion of Printout Showing Example of Gapping

1. Open top cover.
2. Remove ribbon cartridge.
3. Remove platen.
4. Insert a 10-32 screw approximately 1½ or 2 inches in length through hole in right side frame and into threaded hole in print belt tension support casting. Turn screw in until it just begins to make contact with tension arm. This will hold right pulley in its normal running position which will be necessary in later adjustments.
5. Remove rebound belt, print belt, and horizontal scale.
6. Remove the two screws from each end of rebound bar, and carefully remove shims (if present) from under each end of bar.

CAUTION

IN THE EVENT THAT SHIMS WERE ORIGINALLY USED IN THIS PARTICULAR PRINTER, KEEP THE ONES REMOVED FROM LEFT END SEPARATE FROM THOSE ON RIGHT END. SHIMS MUST BE REINSTALLED IN ORIGINAL ORDER.

Push down on center portion of rebound bar enough to disengage it from the two small brackets, and remove rebound bar.

7. Remove toggle assembly.
8. Remove the screw from each end of the rear belt guide and remove belt guide (refer to Figure 5-50). Carefully remove shims from under each end of belt guide taking care not to lose or mix shims from one side to the other.

NOTE

When replacing clevis and plunger assemblies for hammers in column positions 60 to 80, better access to the plunger can be gained by removing the front belt guide also.

9. Locate the hammer associated with affected clevis and plunger assembly, and push hammer with finger toward platen as far as necessary for clevis to clear hammer hook. While holding hammer in this position, slip clevis off hook on bottom of hammer, and let hammer return to its rest position (see Figure 5-50).
10. Grasp loose end of clevis and twist it so as to rotate plunger approximately 45 degrees, and remove assembly by pulling plunger out of core.
11. Insert replacement clevis and plunger by reversing steps 9 and 10 above.
12. Check hammer throw with replacement clevis and plunger by pressing the plunger downward as far as possible and holding it while also pressing down on plunger for an adjacent hammer. If replacement clevis and plunger causes hammer throw to be equal to or slightly greater than adjacent hammer throw, replacement clevis and plunger should be satisfactory. However, if hammer throw with replacement clevis and plunger is less than adjacent hammer throw, prev-

iously installed clevis and plunger should be replaced by another assembly. Replacement of the clevis and plunger assembly should continue until hammer throw is as stated above.

NOTE

With hammer in rest position, check to see if hammer is resting against backstop bar. If not, bend slotted bracket over plunger up slightly to allow hammer to rest against bar.

13. Apply DAG #200 lubricant* sparingly to upper clevis pin on replacement clevis (see Figure 5-50). Also, inspect all other upper clevis pins for evidence of lubricant. If these areas are dry or show evidence of wear or rust, lubricate very sparingly with above lubricant. Only a trace of lubricant should be applied such that there is no chance of lubricant flowing down the clevis into the coil.

NOTE

A suggested technique for applying the lubricant is to pour a few drops out of the container onto a piece of paper, dip one end of a pipe cleaner into the lubricant on the paper, and lightly coat the clevis pins using the pipe cleaner.

14. Reinstall rear belt guide making sure all shims removed in step 8 are in place. Adjust rear belt guide per specifications stated in Table 5-4.

15. If removed earlier, replace and adjust front belt guide.

16. Install toggle assembly.

17. Install rebound bar making sure all shims removed in step 6 are in place. Make sure rebound bar is attached at center portion to the two clips provided by pushing up on bar. Adjust rebound bar per specifications stated in Table 5-4.

CAUTION

ADJUSTMENT OF THE REBOUND BAR IS CRITICAL, THEREFORE, NO TOLERANCE IS ALLOWED. USE EXTREME CARE IN ADJUSTING TO SATISFY STATED DIMENSION.

18. Turn screw (inserted in step 4) all the way in to position right pulley in extreme left position. This will simplify installation of the print belt and rebound belt.

19. Install print belt, rebound belt, and horizontal scale. Remove screw inserted in step 4.

20. Install platen and ribbon cartridge.

HAMMER RETURN SPRING

1. Raise top cover, remove ribbon cartridge, and remove hammer and print belt assembly. Insert a 10-32 screw approximately 1 1/2 or 2 inches in length into threaded hole in tension support casting. Turn screw in until it just makes contact with tension arm. This will hold the right pulley in its normal running position which will be necessary for later adjustments.

2. Remove print belt, rebound belt, and horizontal scale.

3. Remove the two screws from each end of rebound bar, and carefully remove shims (if present) from under each end of bar.

CAUTION

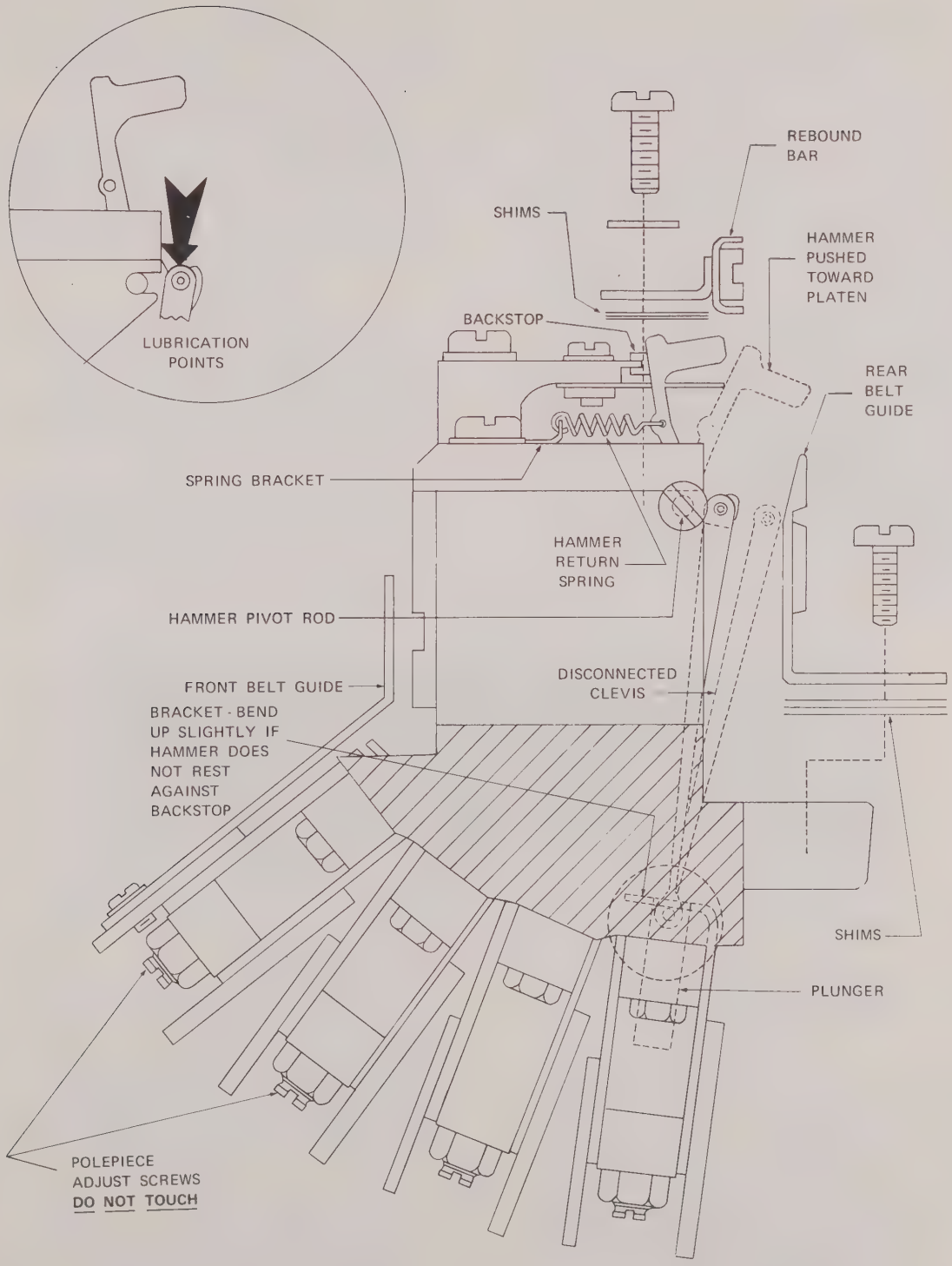
IN THE EVENT THAT SHIMS WERE ORIGINALLY USED IN THIS PARTICULAR PRINTER, KEEP SHIMS REMOVED FROM THOSE ON RIGHT END. SHIMS MUST BE REINSTALLED IN ORIGINAL ORDER.

Push down on center portion of rebound bar enough to disengage it from the two small brackets, and remove rebound bar.

4. Hold hammer and print belt assembly in a vertical position and gently shake it over a work surface to remove any remaining pieces of broken springs or other foreign objects. Rotate assembly around so that upper end will be down, and again shake assembly. Lay assembly on a work surface such that hammer faces are facing upward.

5. Locate the hammer with missing return spring and pull it forward.

*Moly Dag 200 lubricant can be obtained from Acheson Colloids Co. Port Huron, Michigan 48060



PLH-6128

Figure 5-50. Clevis and Plunger Removal

6. Select an Allen wrench or similar object having an O.D. slightly larger than the I.D. of the replacement spring. Place the replacement spring over the end of the Allen wrench or similar object. Orient spring such that spring hook on free end will go over top and into corresponding hole in spring bracket. Also, spring must be oriented so that hook on hammer end will go through hammer spring hole the same way as it does on adjacent hammers.

7. Hook free end of spring into appropriate hole in spring bracket. With a spring hook, grip hammer end of spring, and carefully remove object used to support spring. Hook the spring into the hammer spring hole. Move hammer back and forth several times to make sure spring is properly installed.

8. Check all other hammers to verify condition of hammer return springs. Replace any other springs that are missing or defective.

9. Inspect all upper clevis pins for evidence of lubricant. If these areas are dry, lubricate sparingly with DAG #200, lubricant. For a suggested technique to apply the lubricant, see step 13 in the preceding instructions.

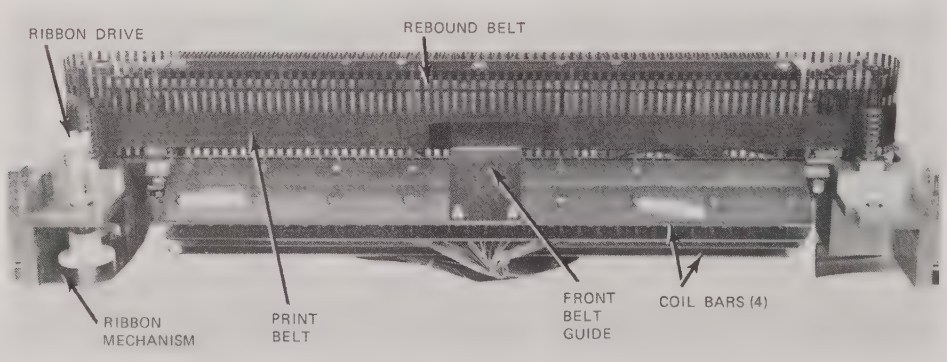
10. Install rebound bar making sure all shims removed in step 3 are in place. Make sure rebound bar is attached at center portion to the two clips provided by pushing up on bar. Adjust rebound bar per specifications stated in Table 5-4.

CAUTION

ADJUSTMENT OF THE REBOUND BAR IS CRITICAL, THEREFORE, NO TOLERANCE IS ALLOWED. USE EXTREME CARE IN ADJUSTING TO SATISFY STATED DIMENSION.

11. Install print belt, rebound belt, and horizontal scale. Remove 10-32 screw inserted in step 1.

12. Install hammer and print belt assembly, and ribbon cartridge.



PLH-6099

Figure 5-51. Hammer and Print Belt Assembly (Front View)

RIBBON DRIVE ASSEMBLY
(Figure 5-51)

1. Remove hammer and print belt assembly from printer.

2. Remove the three mounting screws from the plate under the left side of hammer and print belt assembly. Remove this plate containing three ribbon drive gears. Any one or all of the gears on plate assembly can easily be replaced by removing E rings from gear posts.

3. Slide gear clutch off ribbon drive shaft.

4. Remove the lower E ring from drive shaft, and pull shaft up out of drive support casting.

5. The drive coupling can be replaced by pushing out dowel pin holding coupling to shaft.

6. Before reassembling ribbon drive assembly, inspect condition of the two ribbon drive shaft bushings. One bushing is located in drive support casting and the other one is located on plate assembly. If the bushings show evidence of excessive

wear, they can be replaced by removing them with a bearing puller. Before replacement bushings are installed, coat outside of bushing with Loctite solution. Bushings can then be installed by simply pushing them in place using finger pressure.

7. Install ribbon drive shaft containing drive coupling, dowel pin, upper E ring and shim in drive support casting.

8. Place the lower E ring on drive shaft.

CAUTION

A different style ribbon drive mechanism than is illustrated in Figure 5-52 and 5-53 is used in some printers. When replacing the drive assembly (gear train) portion of one of these mechanisms with the type illustrated, a spacer (part number 44A502073-001) must be used under the gear clutch assembly as illustrated. Also, before re-positioning the gear clutch on the ribbon drive shaft, the shaft must be checked for smoothness around the lower retaining ring groove.

9. Push gear clutch assembly onto drive shaft with gear end down.

10. Before reinstalling plate assembly with attached gears, inspect gear pulley for wear or damaged teeth. If gear pulley needs replacement, the entire pulley shaft with attached gear pulley must be replaced. (See instructions for replacing left pulley shaft assembly).

11. Carefully position plate and gears assuring that gears on plate properly mesh with gear pulley and gear clutch assembly. Secure plate to hammer and print belt assembly with the three screws previously removed.

12. Check operation by rotating left print belt pulley (as viewed from top of pulley) in counterclockwise direction. Drive coupling should also rotate smoothly in the same direction. Next, rotate left print belt pulley in the clockwise direction while holding drive coupling stationary. Clutch action should be such that no torque is felt on drive coupling while print belt pulley is rotated clockwise.

13. Install hammer and print belt assembly in printer.

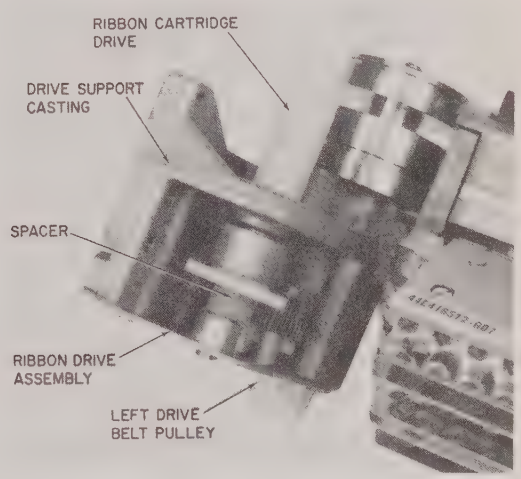
LEFT PULLEY SHAFT ASSEMBLY

(Figure 5-11 and 5-53)

1. Remove hammer and print belt assembly from printer.

2. Remove traveling rebound belt and print belt.

3. Remove the three screws securing the plate under pulley support casting on left side of hammer and print belt assembly, and remove plate with attached gears.



PWL-8003

Figure 5-52. Ribbon Drive Assembly

4. Grasping left print belt pulley, remove nut and lockwasher from top of pulley shaft.

5. Loosen Allen Head set screw in side of pulley and remove pulley from shaft.

6. Remove all shims from top of pulley shaft.

CAUTION

Do not misplace shims — they must be replaced when reinstalling shaft assembly.

7. Pull pulley shaft out from bottom until E ring on shaft is against top surface of bottom bearing.

Firmly grasp shaft assembly by holding gear pulley. The bottom bearing can be worked out of the drive support casting by moving pulley shaft back and forth while pulling outward on shaft assembly. When bearing is worked free, pulley shaft assembly will come out of casting. Bearing can be removed from shaft assembly by removing E ring on shaft.

8. Top bearing can be removed by removing the two retaining screws from top of drive support casting and gently tapping bearing out with a slender, blunt-edged tool extended through casting from bottom side.

9. Before replacing pulley shaft assembly, slide bottom bearing on shaft and place retaining ring on shaft above bearing.

10. Gently press top bearing into top of drive support casting and install the two retaining screws previously removed.

11. Insert pulley shaft through bottom of drive support casting, and gently press bottom bearing into casting.

12. Install all of the shims previously removed over top of shaft.

13. Place print belt pulley on shaft keeping set screw lined up with flat side of shaft.

CAUTION

Exercise care not to overtighten the hex nut in the following step.

14. Install the lockwasher and hex nut on the pulley. Tighten the nut only enough to compress the lockwasher, then tighten the set screw to secure the pulley to the shaft.

15. Install plate with attached ribbon gears to bottom side of drive support casting.

16. Install print belt and traveling rebound belt.

17. Rotate print belt in a counterclockwise direction to check for binding in any of the moving parts.

18. Reinstall hammer and print belt assembly into printer.

RIGHT PULLEY ASSEMBLY

(Figures 5-11 and 5-54)

1. Open top cover.

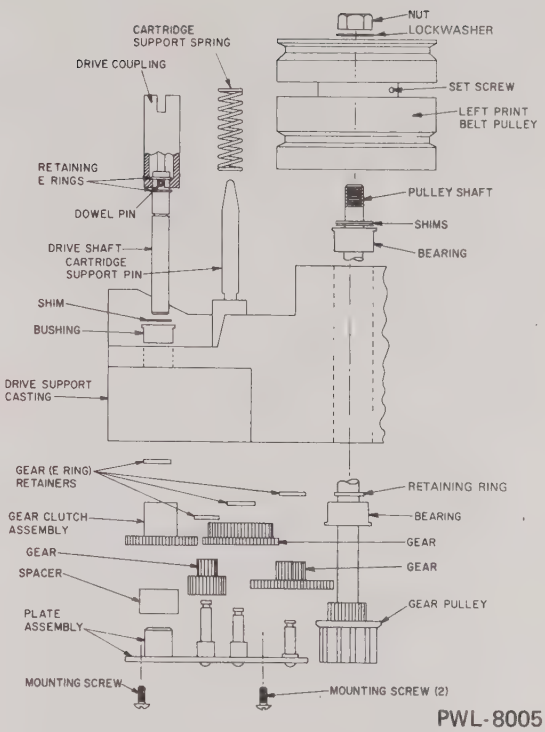
2. Remove ribbon cartridge.

3. Remove traveling rebound belt and print belt.

4. Remove grip ring and spring washer from right pulley shaft, and slide pulley off shaft.

CAUTION

Make sure any removed shims are replaced on shaft before pulley is replaced.



PWL-8005

Figure 5-53. Left Pulley Shaft and Ribbon Drive Assemblies

5. Bearings in pulley are easily removed as follows:

a. Place pulley in upright position on a work surface.

b. Extend a slender, blunt-edged tool through top of pulley at a slight angle to make contact with top surface of bottom bearing. Gently tap tool while moving tool in a circular direction around rim of bearing until bearing drops out of pulley.

c. Turn pulley over and repeat above procedure to remove top bearing.

6. Install bearings in pulley by pushing them in place using finger pressure. Ensure that the bearing outer race will not rotate in pulley. If it does, carefully apply Loctite*222 or Grade H to bearing outer race prior to installation.

NOTE

Loctite may be obtained in 50 cc bottles (G.E. stock number 07831), General Electric Co., DCPBD, Waynesboro VA 22980, or the local distributor of Loctite Corp. products.

* Registered Trademark, Loctite Corp., USA

7. The belt tension spring can be removed by compressing it enough to allow it to slip out between the tension support casting and arm assembly. The spring can be replaced by reversing the above procedure.

8. Slide pulley onto pulley shaft.

9. Place spring washer over top of shaft.

10. Push grip ring onto shaft against spring washer. Make sure grip ring is pushed down far enough to remove all vertical play in pulley.

11. Rotate pulley to make sure there is no binding.

12. Install print belt and rebound belt.

13. Install ribbon cartridge.

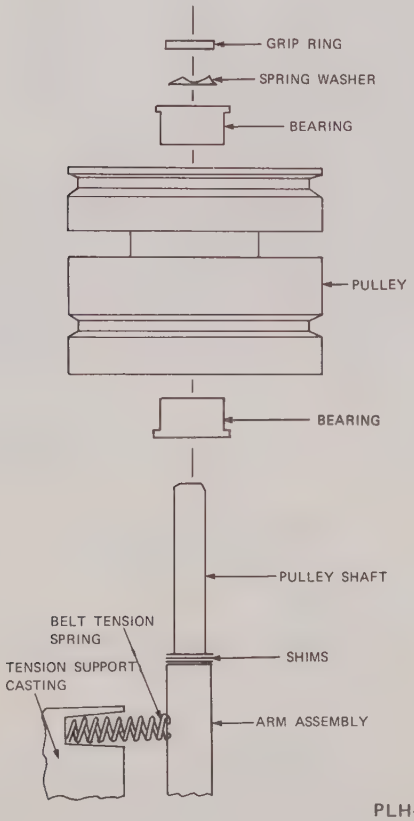


Figure 5-54. Right Pulley Assembly

RIBBON CARTRIDGE SUPPORT SPRINGS
(Figure 5-52)

There are two ribbon cartridge support springs located on the hammer and print belt assembly — one on the left side and one on the right side. These springs fit over the cartridge support pins and can be replaced as follows:

NOTE

Replace both springs as a set when one spring requires replacement.

1. Open top cover.

2. Remove ribbon cartridge.

3. Pry tang on bottom end of spring up over shoulder at bottom of pin, and slide spring off pin.

4. When replacing spring, push tang end of spring over pin first so that tang will lock spring to pin by fitting over shoulder at bottom of pin.

CAUTION

Top part of spring must compress freely over pin.

5. Install ribbon cartridge.

PHOTOCELL ASSEMBLY
(Figure 5-55)

1. Raise top cover.

2. Remove ribbon cartridge.

3. Remove rebound belt and print belt.

4. Remove toggle assembly.

5. Remove access cover under front left side of Printer (see Figure 5-44).

6. Loosen photocell connector at front of main frame.

7. Remove small Allen Head screws from top and left end of photocell assembly. Also, remove spring from left end of assembly.

8. Pull cable (attached to photocell assembly) through space below hammerbank.

9. To install the photocell assembly, push cable under hammerbank until the connector can be grasped by reaching up through the access hole under printer. The cable can then be guided on through under hammerbank until the end reaches the connector at front of main frame. Connect photocell cable.

10. Set photocell assembly on positioning pins on top of pulley casting.

11. Start Allen Head adjustment screw through hole in left side of pulley casting. When threaded end of screw starts showing through hole, place one end of spring over end of screw. Push spring down into cavity on top of photocell assembly, and finish pushing screw through hole and spring. With Allen Head wrench of correct size, turn screw in until threads properly engage small nut in photocell assembly.

12. Insert top Allen Head screw through elongated hole in photocell assembly. Turn in screw until head is almost down on top of photocell assembly.

13. As a preliminary adjustment, turn adjustment screw at left until top screw is centered with respect to elongated hole. Tighten top screw.

14. Install access cover, paper tensioner, print belt, rebound belt, and ribbon cartridge.

PHOTOCELL TIMING (PHASING) ADJUSTMENT

Make the final adjustment of the photocell as follows:

1. Print two lines of characters by activating the internal test circuit in the printer.

2. Place a timing gauge (44A410619-G01), over hammers on left end of hammerbank by placing slots on underside of gauge over the hammers. The top part of gauge must be over printed characters on paper.

NOTE

If the printer is equipped with an optional 44A411444-G01 horizontal scale for print column identification, it must be removed to use the timing gauge.

3. Check centering of characters appearing between hairlines on gauge. If characters are consistently to right or left of the distance between hairlines, adjust photocell timing as follows:

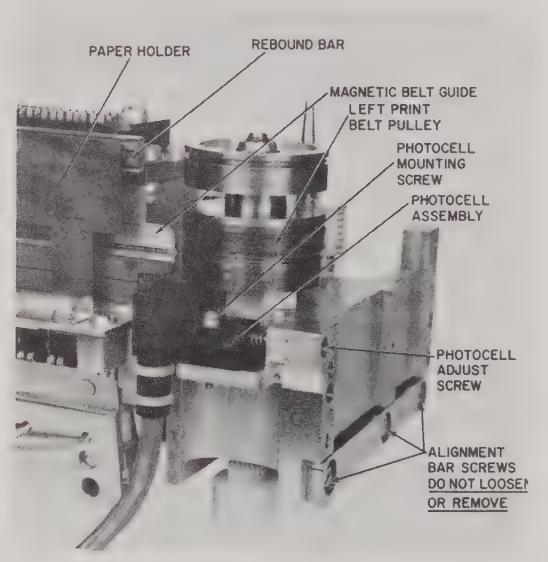
a. Loosen top Allen Head screw on photocell assembly and turn adjustment screw as required.

b. If characters between hairlines are too far to left, turn adjustment screw counterclockwise.

c. If characters between hairlines are too far to right, turn screw clockwise.

d. Tighten top screw on photocell assembly.

4. Install ribbon cartridge and use timing gauge to check timing (phasing) at left, middle, and right end of print line. If character alignment (with respect to gauge) is correct in one or two positions in print line, but slightly out of alignment in another position, an additional fine adjustment of photocell may be needed to average out the difference. This will result in a more consistent character alignment across the entire printed line. If gapping persists after photocell adjustment, replace photocell assembly.



PLH-6101

Figure 5-55. Hammer and Print Belt Assembly—Left End

RIGHT DRIVE BELT

(Figure 5-11)

1. Raise top cover.

2. Loosen the four Allen Head cap screws securing motor to right side frame.

3. Slide motor forward enough to allow removal of belt.

4. Slip replacement belt over motor and right jackshaft pulley.

5. First, slide motor toward rear of printer until maximum belt tension is obtained. Then proceed to adjust motor position for correct belt tension, and tighten the four motor mounting screws. Belt tension is correct when a force of 4 oz. (114 g) applied to the center belt span between pulleys deflects the belt 0.05 to 0.225 inch (1.3 to 5.7mm).

6. Lower top cover.

LINE FEED CLUTCH AND STROBE DISC ASSEMBLY

(Figures 5-56 and 5-57)

1. Disconnect printer from AC power source.

2. Remove paper.

3. Open top cover.

4. Remove power supply cover.

5. Remove cosmetic shield (see note above).

6. Remove platen.

7. Remove detector assembly (TVFC/1) from mounting bracket.

8. Loosen motor mounting screws and shift motor forward to allow removal of right drive belt.

9. Loosen left idler pulley.

10. Remove plate over access hole under left, front of Printer. (See Figure 5-44).

11. Reach up through access hole to remove left drive belt from pulley under hammer and print belt assembly and slip belt off left jackshaft pulley assembly.

12. Loosen both Allen Head set screws in right jackshaft pulley and remove pulley.

13. Loosen both Allen Head set screws in left jackshaft pulley assembly and remove assembly.

NOTE

The left jackshaft pulley assembly contains a unique coupling device which will prevent the printer from losing speed in the event of a power interruption for a duration of up to one cycle (6.7 msec.).

14. Loosen the two Allen Head set screws in linefeed clutch and strobe disc assembly.

15. Push out small round plug in right side of bottom cover adjacent to right end of jackshaft.

16. While holding linefeed clutch and strobe disc assembly with one hand, pull jackshaft to right through access hole in bottom cover far enough for left end of jackshaft to clear linefeed clutch and strobe disc assembly.

17. Remove linefeed clutch and strobe disc assembly by sliding anti-backlash spring off left bearing housing.

18. To replace jackshaft, slide shaft through access hole in bottom cover and part of the way through right jackshaft bearing. End containing cutout for clutch set screw must go in first. Leave room to place clutch over left end of jackshaft.

CAUTION

Tang end of anti-backlash spring must be facing left.

19. With clutch on jackshaft, slide jackshaft to left through left jackshaft bearing.

20. Position clutch so that tang end of anti-backlash spring is placed over end of left jackshaft bearing housing.

21. Position jackshaft so that clutch set screw is centered over groove in shaft. Tighten clutch set screw.

22. With clutch set screw tight, slide jackshaft to left as far as possible.

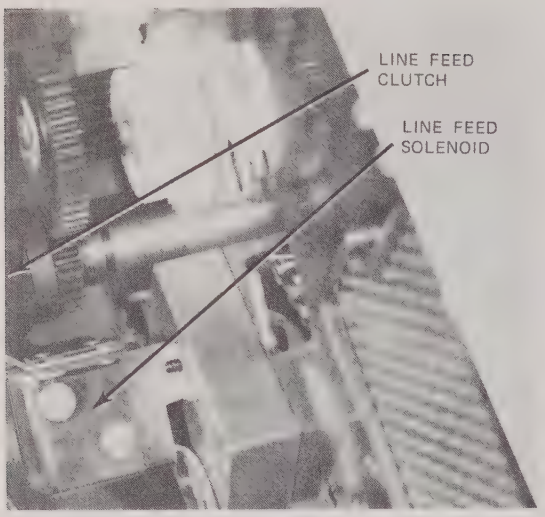
23. Slide left jackshaft pulley assembly over left end of shaft.

24. Place a 0.006 inch (0.15 mm) feeler gauge between outside edge of left jackshaft bearing and left pulley assembly. Push pulley assembly tight against feeler gauge and tighten both Allen Head set screws in pulley assembly. Remove feeler gauge. Check jackshaft end play which should be 0.003-0.008 inch (0.08-0.20 mm).

25. Slide right jackshaft pulley over right end of jackshaft keeping end of shaft flush to 0.06 inch (1.5 mm) beyond outside edge of pulley. Tighten both Allen Head set screws in pulley.

26. Reinstall left drive belt.

27. Reinstall right drive belt and adjust for correct belt tension.



PLH-6103

Figure 5-56. Linefeed Clutch

28. Rotate print belt counterclockwise a few revolutions to check for binding.

29. Install round plug in right side of bottom cover.

30. Install plate over access hole under left, front of printer.

31. Check adjustment of linefeed solenoid. Solenoid actuating arm should clear highest clutch lobe by 0.005-0.010 inch (0.13-0.25 mm) with arm in energized position (see Figure 5-58).

32. Lubricate gear teeth on clutch gear and on mating gear with Lubriplate #630-AA, ME-D6A3.

33. Reinstall detector assembly (TVFC/!).

34. Reinstall platen.

35. Check adjustment of slew strobe assembly.

36. Reinstall cosmetic shield and power supply cover.

37. Close top cover and install paper.

38. Connect printer to AC power source and check operation.

NOTE

Test pattern used with built-in test circuit on printer is an excellent check for correct linefeed clutch operation.

JACKSHAFT BEARINGS

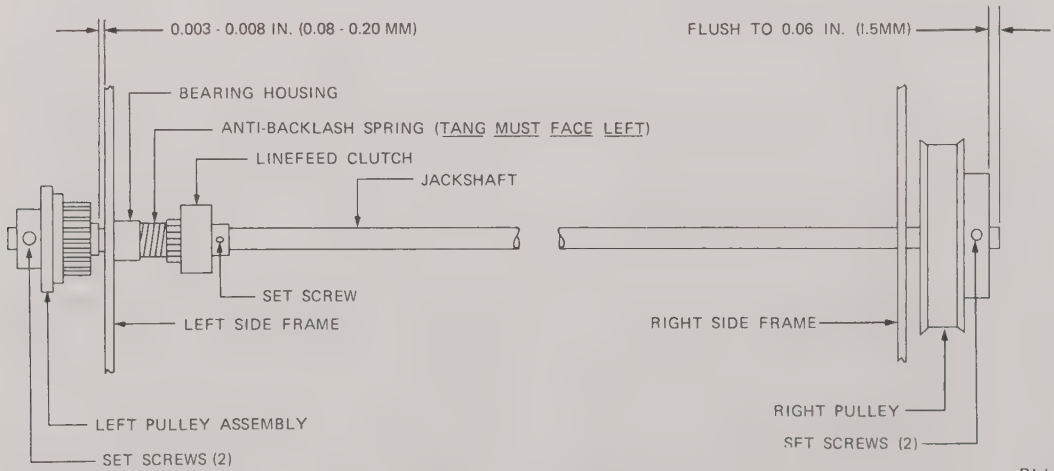
1. Remove jackshaft and linefeed clutch.

2. Using a bearing puller, remove right jackshaft bearing.

3. Insert a long, slender, blunt-edged tool into inboard side of left jackshaft bearing housing. Gently tap end of tool until bearing drops out of housing.

CAUTION

Left and right jackshaft bearings are not interchangeable — the left bearing is longer than the right one.



PLH-6040

Figure 5-57. Jackshaft Adjustment

4. Coat outside surface of replacement bearings with Loctite solution and press them into place (flange end facing out) using finger pressure. Allow sufficient drying time as stated on the Loctite container.

5. Install jackshaft and linefeed clutch.

LINEFEED SOLENOID
(Figures 5-56 and 5-57)

REPLACEMENT

1. Disconnect printer from AC power source.

2. Open top cover.

3. Remove power supply cover.

4. Remove cosmetic shield.

5. Remove platen.

6. Disconnect linefeed solenoid cable from XPS board. Cut cable tie securing solenoid cable to transformer cables.

7. Holding linefeed solenoid with one hand, remove the two Allen Head cap screws and one flat washer supporting solenoid assembly to left main frame. Remove solenoid with attached mounting block from printer.

8. Remove the two slotted screws securing solenoid to solenoid mounting block and take solenoid off block.

9. Replace solenoid by reversing steps 6, 7, and 8 above. Make sure solenoid cable is dressed away from moving parts of printer.

10. Adjust solenoid position (see Adjustment procedure on this page).

WARNING

When power is on with top cover raised and power supply cover removed, DO NOT TOUCH ANYTHING IN THE POWER SUPPLY AREA.

11. Connect printer to AC power source and turn printer ON using the top cover interlock switch.

12. Press the LINE FEED pushbutton on control panel several times while visually checking solenoid operation.

13. Disconnect printer from AC power source.

14. Install platen, cosmetic shield, and power supply cover.

15. Close top cover and connect Printer to AC power source.

ADJUSTMENT (Figure 5-58)

WARNING

Make sure printer is disconnected from AC power source.

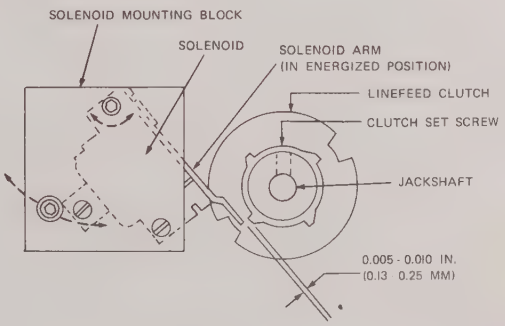
1. Rotate jackshaft by hand until a clutch lobe is lined up with edge of solenoid arm.

2. With solenoid arm manually held in the energized position, rotate solenoid assembly until a 0.005-0.010 inch (0.13 - 0.25 mm) clearance is obtained between solenoid arm and highest clutch lobe. Use a feeler gauge to check clearance.

CAUTION

To ensure error-free operation of the VFU (if employed), it is extremely important that the above clearance be within the specified tolerances — preferably at the bottom end of the range — 0.005 inch (0.13 mm).

3. When solenoid is correctly adjusted, tighten the two Allen Head cap screws securing solenoid assembly to left side frame.



PLH-6039

Figure 5-58. Linefeed Solenoid Adjustment

PLATEN DRIVE GEARS
(Figure 5-58)

1. Disconnect printer from AC power source.

2. Remove paper and open top cover.

3. Remove power supply cover, cosmetic shield, and platen.

4. Remove access cover under left front of printer and slide left drive belt off pulley under hammer and print belt assembly.

5. Remove left jackshaft pulley assembly and slide jackshaft to right until linefeed clutch is out of the way.

6. Remove E ring from the three gear posts on inside of left side frame.

7. Pull gears off posts.

8. The tractor driving gear located on the outside of left main frame can also be removed by removing the E ring on gear post and sliding gear off post.

CAUTION

For printers with serial number 02920 and higher, make sure latest style tractor driving gear (44B500726-001) is used. When using this gear on printers with serial numbers below 02920, replace tractor drive shaft gear with later style 18 tooth gear (44B500797-001). Also, replace platen gear with later style 36 tooth gear (44B500798-001). Gear part number is stamped on inside of gears.

9. Before installing gears, lubricate all gear posts with SAE 10w-20w-30 motor oil. After gears are secured on gear posts, lubricate all gear teeth with Lubriplate #630-AA, ME-D6A3.

10. Slide jackshaft and linefeed clutch in place and replace left jackshaft pulley assembly. Install left drive belt.

11. Adjust jackshaft for 0.003-0.008 inch (0.08-0.20 mm) end play.

12. Connect printer to AC power source and turn printer ON.

WARNING

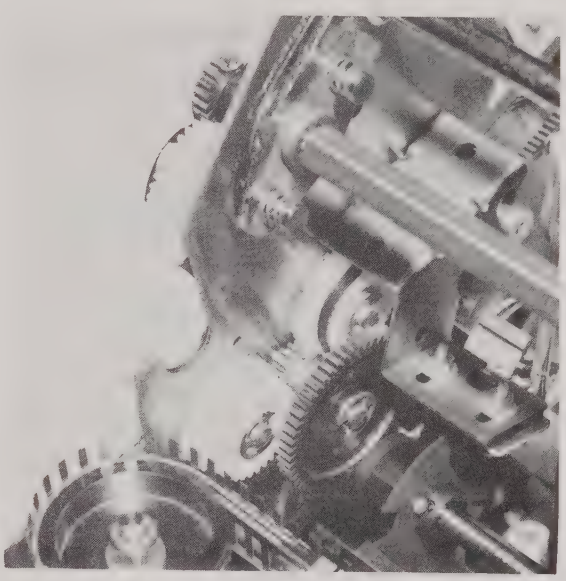
DO NOT TOUCH ANYTHING IN THE POWER SUPPLY AREA WHILE TOP COVER IS RAISED WITH POWER ON.

13. Check gear operation by executing several linefeeds in succession.

14. Disconnect printer from AC power source.

15. Replace platen, cosmetic shield, access cover under left, front of printer, and power supply cover.

16. Lower top cover and connect printer to AC power source.



PLH-7030

Figure 5-59. Platen Drive Gears

PLATEN REPAIR

(Figures 5-60 and 5-61)

The platen assembly can be repaired by breaking it down into its separate piece parts, and replacing any of the individual parts found defective.

DISASSEMBLY

1. Push dowel pin out of clutch assembly (see Figure 5-60), and remove clutch shaft with attached platen knob from platen assembly.

2. Remove outer grip ring from platen shaft.

3. Slide outer gear off platen shaft. If any shims drop out, retain these for reassembly. The shims, if used, go between the flats on the gear and shaft to take up any slack that may exist. This will assure a tight fit between gear and shaft.

4. Remove grip ring from platen shaft securing gear guard and bushing. Slide gear guard and bushing off shaft.

5. Remove grip ring securing inner gear to platen shaft, and slide gear, clutch assembly, and compression spring off shaft.

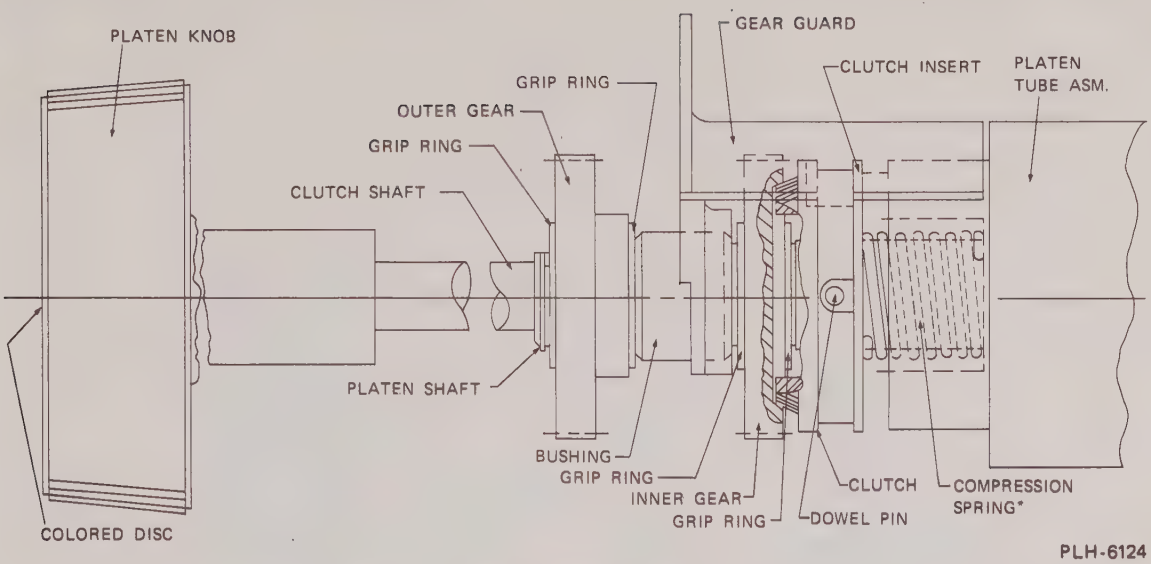


Figure 5-60. Platen Assembly Detail — Left End

6. Remove grip ring from right end of platen shaft and slide bushing off shaft.

REASSEMBLY

Before reassembly, apply a light coat of grease (Lubriplate #630-AA, ME-D6A3) on the inside surfaces of the right and left bushings. Also, apply a small amount of grease on the clutch shaft. Work the grease in between the platen shaft and clutch shaft by moving the clutch shaft in and out several times.

1. Slide grooved bushing over platen shaft on right end of platen shaft, and secure in place with a grip ring.

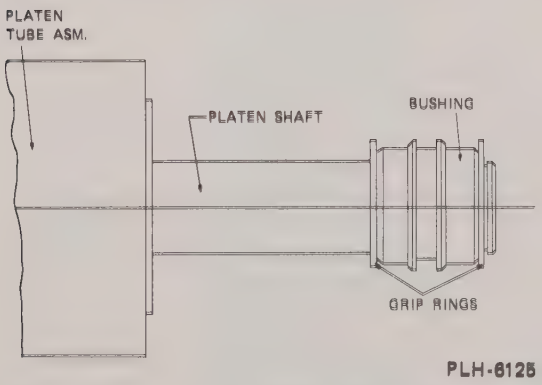


Figure 5-61. Platen Assembly Detail — Right End

2. Slide compression spring, clutch assembly (gear side facing out), and inner gear over left end of platen shaft. Align clutch with pin in left end of platen tube assembly.

3. Install grip ring securing inner gear to platen shaft.

4. Slide bushing and gear guard onto platen shaft and secure in place with grip ring.

5. Install outer gear plus shims (if any) onto platen shaft and secure in place with a grip ring.

6. Insert clutch shaft with attached platen knob into end of platen shaft, and secure with dowel pin in clutch assembly.

7. Check platen assembly as follows:

a. Bushing on right end of platen shaft should turn freely.

b. Push and hold platen knob in. Inner gear should turn freely.

c. Release platen knob. Platen knob and clutch shaft should snap back with clutch engaging inner gear.

APPENDIX A

DEFINITIONS OF TERMS

(SEE NOTE 1)

AA	protective ground (Note 2)
AB	signal ground
AC, ac	alternating current
AMP, amp	amplifier
ANSI	American National Standards Institute (formerly ASA, American Standards Association)
APL	advanced programming language
APPROX, approx	approximately
ASCII	American Standard Code for Information Interchange
ASR	Automatic Send-Receive
B	battery
B	Motor, servo
BAUD, baud	a unit of signaling rate (from Baudot)
BB	received data
BOT	beginning of tape (text) (transmission)
BPS	bits per second
BS	backspace
BSI	British Standards Association
C	centigrade or Celsius
C	capacitor
CA	request to send
CB	clear to send
CC	dataset ready
CCT	coupler cut through
CD	data terminal ready
CE	ring indicator
CF	received line signal detector
CKT, ckt	circuit
CM, cm	centimeter
COM	computer output microfilm
CONT, cont	continued
CPI, cpi	characters per inch
CPS, cps	characters per second
CPU	central processing unit
CR	diode
CR	carriage return
CRT	cathode-ray tube
CSA	Canadian Standards Association
CTL	control function
CTS	clear to send
DB, dB	decibel(s)
DC, dc	direct current
DCE	Data Communications Equipment
DIA, dia	diameter
DIM., dim.	dimension
DR	data ring
DSR	data set ready
DT	data tip
DTE	Data Terminal Equipment
DTR	data terminal ready
E	terminal
ECMA	European Computer Manufacturers' Association
EIA	Electronics Industries Association
EOT	end of tape (text) (transmission)
ESC	escape code
F	fuse
F	Fahrenheit
FF	form feed
FIFO	first-in first-out
FIG., fig.	figure
FT, ft	foot, feet
G, g	gram(s)
G/CM^2, g/cm^2	grams per square centimeter
GHZ, gHz	gigaHertz, 10^9
GND, gnd	ground
HZ, Hz	Hertz (formerly CPS, cps, cycles per second)
I/O	input/output
IC	integrated circuit
IEC	International Electrotechnical Commission
IN., in.	inch, inches
IPS, ips	inches per second
J	receptacle, female connector, jack
J	wire strap, jumper
K, k	kilo (1,000), 10^3
KG, kg	kilogram(s), 1,000 grams
KSR	Keyboard Send-Receive
L	inductor, coil, winding
LB, lb	pound(s)
LED	light emitting diode
LF	line feed

LIFO	last-in first-out
LP	Line Printer
LPM, lpm	lines per minute
LSI	large scale integrated (circuit)
M, m	meter
M	1,000,000, 10^6
MA, ma	milliampere(s)
MAX, max	maximum
micro	$\frac{1}{1,000,000}$
MH, mH	milliHenry(s), 0.001 Henry (or henry)
MHZ, mHz	megaHertz
MIN, min	minimum
MIN, min	minute(s)
MODEM, modem	acronym for a modulator-demodulator device
MS, ms	millisecond(s), $\frac{1}{1,000}$ second
MSR	Magnetic Send-Receive
MTA	Magnetic Tape Accessory
MTT	Magnetic Tape Terminal
nano	one billionth, 10^9
NC, nc	normally closed
NHA	next higher assembly
NI	not illustrated
NIP	non-impact printer
NO, no	normally open
OCR	optical character reader (or recognition)
OEMI	Office Equipment Manufacturers Institute
OH	off hook
OZ, oz	ounce(s)
P	plug, male connector
P	potentiometer
PB, pb	pushbutton
PPS, pps	pulses per second
PRI, pri	primary
PTA	paper tape accessory
PWB	printed wiring board
Q	transistor
R	resistor
RD	received data
REQD, reqd	required
RFI	radio frequency interference
RI	ring indicator signal
RLSD	received line signal detector
RO	Receive Only
RPM, rpm	revolutions per minute
RPT	repeat
RTS	request to send
S	switch
SAE	Society of Automotive Engineers
SEC, sec	second(s), secondary
SG	signal ground
SH	switch hook
T	transformer
TCA	TermiNet Cassette Accessory
TD	transmitted data
TP	test point
U	amplifier
UL	Underwriters' Laboratory
UW	used with
V, v	volt(s)
VAC, vac	volts alternating current
VDC, vdc	volts direct current
VFU	vertical format unit
VR	voltage regulator
VT/FF	verticl tabulation and form feed
W	watt(s)
	ohm(s)
u	micro, $\frac{1}{1,000,000}$
UF, uf	microfarad(s)
USEC, usec	microsecond(s)
us	microsecond(s), $\frac{1}{1,000,000}$ second
Ø	phase
	sigma (summation)

NOTES

1. This definition of terms is not intended to provide information on specifically used signal names and their definitions.

2. Preferred abbreviations/terms are used in this list; however, other terms are sometimes used in data communications.

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